

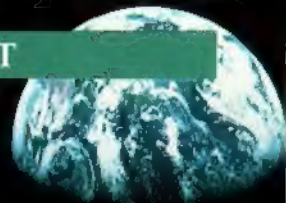
2<sup>ND</sup>  
ANNIVERSARY  
ISSUE

THE FUTURE OF GARBAGE

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# GARBAGE

THE PRACTICAL JOURNAL FOR THE ENVIRONMENT





# RECYCLING TIME



This watch is a piece of junk. Its metal workings are made entirely from recycled cans. In fact, the everyday "tin" can is made of 100% recyclable high grade steel. And if we all recycle, cans will provide the best means to build our bridges, skyscrapers, automobiles—even precision watches. For the location of a recycling center near you, call the Steel Can Recycling Institute, 1-800-YES-1-CAN. We think you'll agree, the time to recycle is now.

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# HOW MANY FOSSIL FOOLS DOES IT TAKE TO SHIP A MILLION GALLONS OF WATER?

It should be common knowledge that the sale of beer and other drinks that have water as their main ingredient is a very lucrative business. The same applies to common cleaners and other household products.

With the dawn of an ecological movement in the U.S., it should be understood that plastic bottles filled with mainly water and a little bit of cleaner just aren't enough, even though the contents may be more beneficial like "less toxic, biodegradable, green, etc."

BIO SHIELD is a new star on the bright heaven of ecologically sound products. **BIO** comes from the ancient Greek language and means "life". **SHIELD** is the Old-Germanic word describing "protective armament". The underlying suggestion in the name **BIO SHIELD** therefore is "to protect life".

BIO SHIELD is proud to introduce a number of new products, including a variety of natural, low-toxic, and low-odor cleaner concentrates, liquid "low-scent" soap, dish washing detergent, and a variety of paint products.

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- ♦ As a revolutionary feature we offer an unusual packaging of our products. All liquids are sold in the highest possible concentration (1:2 up to 1:20.) This saves shipping costs and fuel and is considerably more ecological. It also lowers the waste of packaging materials.
- ♦ Small amounts of concentrate are sold in glass bottles. Larger amounts (1 & 5 Gallons) are sold in reusable, refillable plastic containers which can be shipped back to us for refilling.

## BIO SHIELD - the first American Plantchemistry company.

Our aim is to develop and manufacture high quality paints, wood preservatives, stains, cleaners, and other specialty products for a healthy American home. There will also be a variety of products for chemically sensitive and allergic people - some of these products will contain non-aromatic synthetic hydrocarbons - a low-allergy approach that has been proven to be very effective in the past.



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The history of Casein paint is as old as the history of paint itself - more than 5000 years. Most Egyptian paintings as well as those of Pompeii and other great architectural places in the Mediterranean, the "old civilized world", were painted with Casein paints and organic earth pigments.

Casein paint has numerous advantages, the major one being that it is extremely low-allergenic. For instance, chemically sensitive people can paint their bedroom in the morning and already sleep in it at night without any reactions.

Casein paint does not rub off the walls and is lightly washable. Painted surfaces can easily be repaired. For this purpose small quantities of powdered paint can be stored virtually forever.

A number of non-toxic, organic earth pigments is offered for mixing with the Casein paint. The pigments are free of toxic metals and an extremely wide selection of beautiful colors may be achieved.

A low-toxic stripper for the removal of old enamel and oil based paints is being introduced, also a new, high quality wall paper glue, and finally a low-toxic, non-allergenic casein glue for wood.

## WHO WE ARE

BIO SHIELD is a new product line of the Eco Design Company which was founded in 1982. The aim was (and still is) to provide high quality products for a healthy American home. We can now look back to over eight years of experience in the development and distribution of low-toxic paints, stains, wood preservatives and cleaners.

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Cover: Photography by Horizon/Model by Happy Massee/Photos courtesy of NASA





# The Future of Garbage

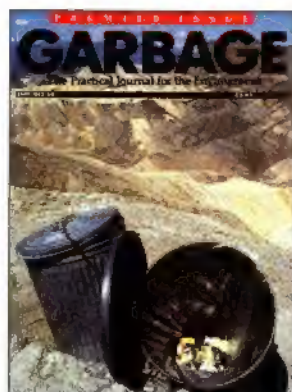
**GARBAGE is two years old. Garbage is ageless. Garbage isn't the problem.**

**G**ARBAGE is, essentially, a service magazine ("the practical journal...") and as such I should use this space to lead you to the

goodies in this issue. Think of other service magazines: "Springtime is upon us once again, and, like our readers, we editors are shaking out the rugs and thinking about planting the garden. Be sure to see our "Pretty in Pink" garden feature on page xx..."

I can't leave tradition alone, though; I must deliberate for hours over what I want to say this time. It's tough because often what I want to say on waste or attitudes or the "environmental scene" is a still-evolving commentary; and sometimes what I want to say makes people angry. I've been applauded for honesty and verbally attacked for inconsistency. Certainly, my current perceptions are not the last word.

GARBAGE is two years old with this issue. In that time, I've been steeped in the literature; I've shared talk and a few dinners with the thinkers and doers from universities, Fortune 500 companies, sanitation departments, and grassroots recycling centers. In short, I've been in the thick of it, and some (apparent) truths have appeared. For example....



1989

## GARBAGE IS NOT THE PROBLEM.

Sound simplistic? Only as simplistic as thinking that garbage is the problem, that sorting your HDPE from your aluminum is somehow going to save the Earth. In general, what we throw out — whether it's 1.783 pounds per person per day, or four pounds — isn't going to hurt anybody. We'll find a place to put it that's relatively affordable and relatively safe. If we find a way to reduce, reuse, and recycle everything in our houses — if we compost every diaper in the whole wide world — we'll have done something commonsense and worthy. But even that won't save the world:

Not if poor countries exponentially increase their unsustainable populations. Not if privileged countries base their economies on runaway consumer growth. Not if you and I use our gas-guzzling automobiles every day.

Dag-nammit! don't you wish garbage *were* the problem? It's the only environmental problem we can imagine solving — and that's precisely why garbage got its bad rap.

## GARBAGE IS A SYMBOL.

I see you smirking, dear reader, and in answer to your tease, yes, we still need GARBAGE (the magazine). Our name (if slightly tongue in cheek) is symbolic of a whole lot more, just like the stuff itself.

As you sort your potentially-recyclables, you are coming face to face



1990



1991

with the consumer society. These days you know how much paper you discard, what your groceries come packaged in, that plastic has many faces, and that rotting food can be composted. You and I have a better sense of just how much of the world we consume, how many single-use items we partake for convenience, and why it costs money to get rid of things (i.e., because there is, after all, no garbage fairy who turns it into stardust when we leave it at the curb).

What do we do with this information? Time will tell ... but consider it the therapy that comes before life change. A little insight never hurts.

On this second anniversary of GARBAGE, I sit on my porch rereading the very first issue. In many ways, the magazine has come a long way. We've snared some terrific writers, we slog determinedly into controversy, we've got a sharper look. But the first issue had an energy we haven't yet duplicated: an optimism, a belief in individual action, a sense of fun. The first issue held a mirror up to ourselves.

Let me renew my commitment to you: The road ahead will not be an easy one, but we will roll on, veering neither sharply to the right nor to the left, in a spirit of adventure, with optimism and perspective.

*Patricia Moore*  
Editor

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**GARBAGE**

**Garbage in Japan**

**An Oil Spill —  
Into the Food Chain**

**Holidays Without  
Garbage**





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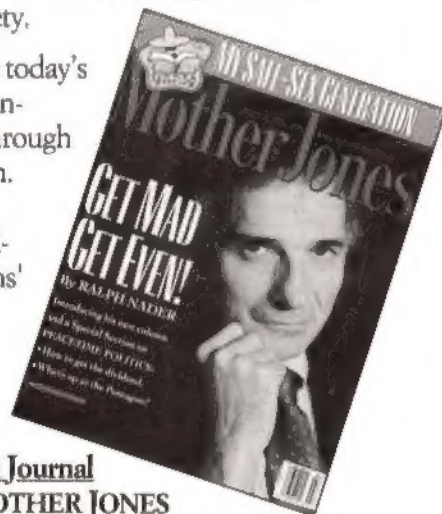
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**Tires and People:  
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**How're We Doin'? ... Population and the "A" Word ...  
Elwood Update ... Dumpster Goodies ... Easy To Push Around**

*In the March/April issue, Patricia Poore asked for readers' comments on the media's role in covering the environment. We've received scores of responses. Here are just a few of your thoughts on the most burning question: why do we need GARBAGE?*

**I WANT MY  
GARBAGE!**

**W**hy should GARBAGE exist? Is it enough that my wife and I devour it upon arrival and spend a lot of thoughtful hours reading and rereading the articles in each issue? Is it enough that we have learned from the magazine how to make less of an impact? With a balanced use of recycling, source reduction, and composting, our weekly trash production has

fallen from three bags a week to one. We have also been passing tips around.

We look to your magazine for information. Some of this information educates; some, frankly, scares us. Learning the consequences of actions which may seem benign can be very enlightening and motivating. If one is allowed to toss one's trash into a hole and — poof — it painlessly disappears, then there is no incentive to change. You help provide incentives.

Curtis S. Krause  
Vernon, Conn.

**KEEPING UP  
WITH THE U.S.**

I need to read the in-depth articles to get a better understanding of major issues. I like to read the articles that entertain and inform. I

want to know the answers to the popular questions.

As a recycling coordinator for a community of 25,000, I am interested in learning what communities across the nation are doing. Here in Washington, we work to keep up with Seattle, but there are hundreds of communities out there involved in the same process, which have devised unique solutions.

I would urge you to continue to do what you are doing, but don't be afraid you will write "above" the reader's level. This is the way we will learn.

Shan Vipond  
Recycling Coordinator  
Puyallup, Wash.

**KEEPING UP WITH  
THE SEYCHELLES**

I am the environmental officer for the public utility in the Republic of Seychelles, which is made up of 100 islands and a population of 67,000. I subscribe to GARBAGE to keep abreast of practical solutions to resource recovery. I need information that covers both small-scale endeavors and regional interaction: i.e., what is Mauritius doing; does Mombasa refine sludge oil; what do we do with toxic pesticides which originate in the U.S. (where they are banned) and end up here via Singapore or Sri Lanka?

Perhaps an international bent is not what you envisioned for your maga-



ILLUSTRATION BY LLOYD DANGLE



zine. However, unless the "1st World" is interested in the other world, environmental problems will just be moved from one backyard to another.

Elaria G. Smith  
Republic of Seychelles

## WHERE'S OUR SOAPBOX?

Yes, it's important to present the facts and all sides of an issue, but there comes a point at which it's important to take a stand, too. You'll no doubt offend some people, but what's life without a little controversy, a little arguing? I think it would be equal-

ly important to clearly mark your "stand" as such. Don't leave it up to the reader to wonder whether the article in question is "just the facts" or an actual editorial. Be clear when it's your opinion. Then let the resulting Letters to the Editor fly!

Kim Noble  
Newfane, Vt.

*Stephanie Mills' article on overpopulation generated an exceptionally large volume of mail, even by our readers' standards. Below is a sampling of responses which reflect the range of opposing opinions.*

## ABOUT THAT CHECK...

The May/June issue reached the newsstand just in time for me to rip up my check for a subscription to your mostly-excellent publication. Stephanie Mills' personal opinions dealing with controlling population growth through abortion represent the ultimate in heresy for a professed environmentalist. How can you advocate a practice that uses only methods that any earth-conscious person strives to eliminate? Why support feticide as an appropriate form of birth control when it only deals with the problem of an un-

wanted pregnancy after the fact, a pregnancy for which the only excuse is just plain laziness!

You and Ms. Mills are entitled to your own twisted view of practicality, but to put it down as a practical solution to the population problem is totally irresponsible. Abortion as a means of population control is completely unnecessary, can you deny that? Pregnancy is just about the easiest "problem" to prevent today, and isn't that what you're supposed to be about — practical solutions and an ounce of prevention instead of a pound of cure?

J. Donnoway  
Slidell, La.

*Continued on p. 10*



100% Solar Powered New England Home, photo courtesy Steve Strong

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# Test your GARBAGE IQ Take this E-Z Quiz!

## 1. The term "greywater" generally refers to:

- The water surrounding fuel rods in a nuclear plant.
- Wastewater from household sources used to water lawns and gardens.
- Tainted spring water.

## 2. When completed, the largest structure in the world will be:

- A 42-screen multiplex in the San Fernando Valley.
- The Leningrad McDonald's.
- The Fresh Kills landfill on Staten Island, New York City.

## 3. "Compact Fluorescents" are:

- New pesticides that are highly concentrated and very toxic.
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Answers:  
1-b; 2-c; 3-b; 4-f



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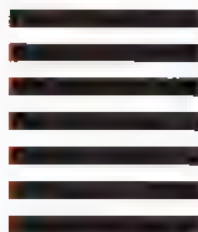
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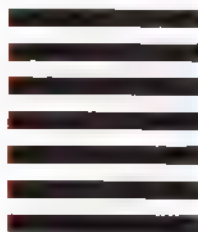
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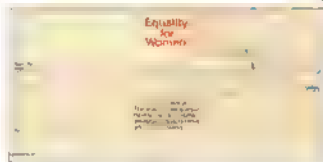
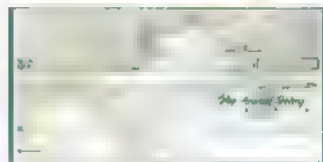
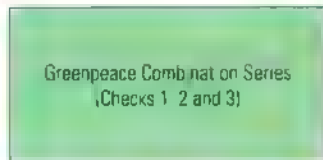
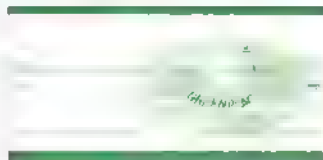
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## WE'RE GARBAGE

**Y**ou stated that GARBAGE would not be a political magazine, yet you brought in the "A" word and changed all that.

What kind of a society have we become that we wash, scrub, and soak labels off of jars; that we even seriously consider having a compost pile with worms under the kitchen sink; but it's okay to throw our children in the dumpster?

I say garbage is what your magazine really is now, and I for one will not purchase it again.

*Deborah W. LaPonsa  
Bloomfield Hills, Mich.*

OVERLY  
CONSUMERED

**I** was disappointed by your article, "Population," despite a few good points made. True, population is one factor responsible for our environmental problems, but other factors are having more of a negative impact on the health of our environment. It is misleading to profess that overpopulation, which primarily occurs in developing countries, is more detrimental than the lifestyle of people in developed countries.

You mention but give little emphasis to overconsumption, which is directly linked to wastefulness and pollution, and which oc-

curs primarily in developing countries.

You omit completely the existing inequity of natural resource distribution throughout the world. This is a tremendous stress for people in developing countries, who often need to walk for miles to gather fuelwood, food, and water — if they can find such resources. This lack of essential resources forces people to farm marginal lands and create other stresses. Population is a less harmful factor than lack of resources in developing countries, and the wasteful lifestyle of people in developed countries.

*Paul Schwartzman  
New York, N.Y.*

## MY HEROINE

**B**ravo for Stephanie Mills!

I'm glad she mentioned the adverse impacts of the anti-abortion folks on population policies designed to minimize human misery and ecological destruction. I am sure that the anti-abortion activists truly believe that they are working to diminish human suffering. However, unwittingly they are setting the stage for dreadful and massive despair through their "successes," as our ecosystems continue to collapse under us. The population-driven collapse has already begun, to wit our depleted fisheries, unprecedented rates

*Continued on p. 13*

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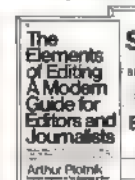
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Harold looked for the small print but couldn't find any. Though he did discover a new strain of bacteria.

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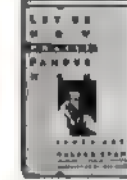
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of species loss, soil erosion, global warming, and a pending energy crunch, to mention a few.

One point was missed in the discussion of anti-abortion politics, however. These very same political interests oppose all other family planning as well. Readily available family planning services have been repeatedly shown to reduce rates of abortion. Wouldn't support of family planning be more consistent with their efforts to reduce the incidence of abortion? It appears to me that the activists in this camp are on a campaign to condemn every couple and the entire planet to raising a maximum number of

children — never mind whether they can be fed, clothed, or educated.

*Stephen Mabley  
Washington, D.C.*

### TABOO TO YOU, TOO?

I wish to congratulate Stephanie Mills and the GARBAGE staff for taking a courageous stand on the population issue.

You realize, of course, that the subject of population control is "taboo" in our otherwise enlightened society. However, the truth remains — if Earth's human population is allowed to escalate freely, the effects of over-

population will all-too-soon result in the inexorable and horrible destruction of most, if not all, life on the planet. People may have the right to choose this fate for themselves, but they have no right to choose it for their children and grandchildren, much less for their fellow man's children.

Thanks for telling it like it is. It just doesn't make sense that the most intelligent species on the planet should destroy itself, along with numerous other species, simply because they believe that they have a right to do so.

*Frank A. Smith  
Crystal Lake, Ill.*

### ART APPRECIATION 101

Wow. Where do I begin ... talk about "unclear on the concept." Donna LaGrafte's letter (July/August) takes a verbal bludgeon to Elwood Smith's light-hearted and eloquent cover (March/April), which uses a handcuffed bird and a rabbit on a rope to run a recycling machine. She realizes it's a cartoon, "but the message is still there, loud and clear." What is the message, pray tell?

Her solution (to leave out animal drawings, pictures, etc.) is pretty draconian. Often, part of the readership of any magazine

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fails to get the message. It bothers me when a complaint is published from someone who hasn't gotten the point and can't appreciate quality artwork.

Mr. Smith's illustrations are renowned for their whimsical, absurdist references to images very deeply imbedded in the public consciousness. To me his cover says what your magazine wants to say: The job of conservation seems at times a crazy, complex job, but it must be done, so let's get on with it in a spirit of ingenuity, determination, and good humor.

Enough said. Keep up the great work.

Rob Saunders  
Professional Illustrator  
Brookline, Mass.

## DUMPSTER DIVING

**T**hank you for your article (May/June) on dump picking and dumpster diving. The article came out right in the middle of peak season for college dumpster diving. I am glad to report that I overcame my embarrassment and made several very productive forays through the campus trash heaps. In fact, I made one of my most memorable dumpster scores ever: a stamp dispenser with 100 "F" stamps inside! I used one to mail this letter (I also scavenged the paper and envelope).

Daniel Cross  
Flagstaff, Ariz.

## OUTTA GAS

**I** applaud your "In the Dumpster" (May/June) on power lawn mowers. Not only are hand mowers quieter (mow at 5:00 A.M.), cheaper (starting at \$65) and pollution free, but your spouse or children can never again use the excuse "can't mow now, no gas."

Contrary to popular belief, hand mowers are much easier to push around than their much heavier, bulky, illegitimate brother!

So try one out. It's great sharing a conversation with someone while you mow, without fear of injury from a rock or stick propelled at

a high rate of speed! Sometimes, things of the past truly are better!

Russell Voigtlander  
Shreveport, La.

Want to dump on something, or recycle a bright idea? Unload on us. Write to: **GARBAGE**, Letters to the Editor, 435 Ninth Street, Brooklyn, New York 11215

## CORRECTIONS

The article on tire recycling (May/June) contains two incorrect phone numbers. The Tire Retread Information Bureau can be reached at (408) 372-1917. Rubber ties designed by Denny LaShier can be ordered by calling (413) 774-4349.

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# Eat Sludge and Die

## Fighting sewage flies without using chemicals

**A** tramp through the sludge fields? I stubbornly wore a skirt and sandals, hoping to avoid a down-on-the-knees approach to this story: how one innovative sanitation district canned the pesticides to battle flies with insects

Somewhere between the parking lot and the office, I lost my photographer. "He was right behind me," I assured

Brett Offerman, lead operator and my guide for the afternoon.

We finally found him crosslegged in lush grass, his camera on a yellow ranunculus in full bloom. "Great landscaping!" he said.

"Reclaimed water," Brett said.

The sludge fields are asphalt areas the size of football fields where the forty tons of sludge daily generated by residents of California's Simi Valley goes to dry out. They're surrounded by golden hills and the biggest stand of oaks in the valley.

Brett explained that while the Simi sewage plant, in operation for 20 years, uses traditional treatment, "We are al-



### • Pilgrim's Progress

This past May, a quirky cavalcade of 24 solar- and electric-powered vehicles cruised the 250 miles of blacktop that winds from Albany, N.Y., to Plymouth, Mass. They were competing in the American Tour de Sol, a five-day race featuring non-polluting prototypes which may one day displace that aging dinosaur, the gas-powered car.

Built by students from Conval High School in Surry, N.H., the Sol Survivor II (top) sports four wheels, an innovation among solar racers. College students from Southbury,

Conn., melded a '52 MG body and a '69 VW chasis to create Sunbird, which maxes out at 55 mph — and you can still hear the birds chirp.

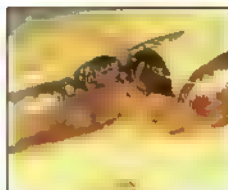
— Steven Corey







**Brett Offerman** tosses fly predators (top), which nest in sludge-pest pupae.



BRANDON JONES

MAX E. BADGLEY

ways looking ahead. A few years ago, [the sewage] ended up in wastewater lagoons. Huge black clouds of flies would rise off the surface every time a breeze came up. We're too close to the city for that ... it was a problem."

The neighboring city of Moorpark apparently thought so, too. When they sent out a health inspector to check for mosquitoes and breeding flies, Simi came up guilty.

"It was pretty soon after that," said Brett, "that we got the belt press and went to sludge fields instead."

The belt press is what it sounds like: an enormous "wringer" that squeezes most of the liquid out of sludge from the primary settling tanks, and turns it into a black, gritty substance that looks like coffee grounds but hardly smells like breakfast. The sludge is dumped on the asphalt fields and left to dry for about seven days before being carted to the landfill.

We were at the edge of a sludge field now and I was high-stepping in my lousy san-

## FOR THE RECORD

*"If VDTs really do cause cancer, shouldn't Joyce Carol Oates be dead by now?"*

Columnist Dave Shiflett, questioning the health effects of electromagnetic radiation from video display terminals. (*Wall Street Journal*, April 4, '90)

## GARBAGE DICTIONARY

**NIMBY** — *imperative*. This acronym for Not In My Backyard sums up our kneejerk reaction when plans for the new landfill or incinerator are unveiled. To activists, it's a rallying cry; to politicos, it's an oath that can run them out of office.

Janet Fagan, associate librarian for mega-waste handler Browning Ferris Industries, sleuthed a 1982 *Nuclear News* article crediting a chemical engineer named Walton Rodger with conceiving the term. "These nuke guys are a rich source — they must just sit around splitting atoms and coining acronyms," cracks Ms. Fagan. (Efforts to reach Mr. Rodger were unsuccessful.) NIMBY has practically achieved household status. But have you heard these new entries to the garbage world's vernacular?

**GUMBY** — Gotta Use Many Backyards. The divide-and-conquer method of siting hazardous-waste dumps and the like. "You've got six sites, and you only need to use one," explains Brian Lipsett of the Citizen's Clearinghouse for Hazardous Wastes. "You try to get people to fight it out." The town offering the weakest opposition gets the dump.

Source: Brian Lipsett, CCHW

**YIMBY (FAP)** — Yes In My Backyard (For A Price). A new siting tactic: Waste-handling firms pay fat inducements, including road improvements, free disposal, and a piece of the dumping fee (which can total in the millions of dollars), to any community willing to "host" a large regional landfill or incinerator.

Source: Allen Blakey, Nat'l Solid Wastes Mgt. Assoc.

*Continued on p. 18*



## FOR THE RECORD

*"The slavery of hours spent commuting in a car each day can no longer masquerade as freedom."*

NRDC Attorney Richard Ayres, writing on the revised Clean Air Act. (EPA Journal, Jan/Feb '91)

dals. My photographer was out of sight, tracking a red-tailed hawk.

"Getting rid of the lagoons helped," Brett continued, "but we still had flies — plenty of 'em."

Commercial fly sprays are almost all pyrethroid-based. Though low in mammalian toxicity, they were developed as premix sprays — to be used in barns and stalls — and are nearly useless outdoors, where they're

swept away by a passing breeze. Brett also tried Golden Malrin, a carbamate-based powder, set out in five-gallon cans at the edges of the fields. "Our area is just too large," he told me. "We couldn't lure the flies into the traps. Then we heard about fly predators."

Brett's predators are technically called parasitoids, Hymenopteran insects of the Chalcididae family. They are harmless, stingless creatures, no larger than a fly's head.

They depend entirely upon fly pupae for survival. Once a female predator locates a fly pupa, she punctures the outside of it with her sharp ovipositor, deposits up to seven eggs, then moves on to find another incubator. When her eggs hatch, her larvae consume the developing flies, killing some of the next generation.

A predator can lay 200 to 300 eggs, but a pest fly lays up to 1,000. Predators take up to 28 days to develop, but flies take only ten. Flies always outnumber the parasitoids; for control, therefore, flies must be overwhelmed by regular releases.

"Our predators [from Spalding Laboratories] come inside fly pupae, ready to hatch out," says Brett. "Every two weeks from April to September, we scatter 360,000 of them in a 10x50-foot area in each field." At \$1.60/1,000, predator use on this scale is a commitment, but as Brett says, "We have very few flies now — a drastic change."

Simi Valley sanitation engineers take one more precaution. Some months ago they purchased a Howard Rotovator HR40, a large rototiller that's pulled by their Ford TW-25 tractor. "The combination of preda-

**NIMTOF** — Not In My Term Of Office. A waste-industry tag for politicians who buckle under to community opposition, leaving their successors to deal with the problem.

Source: John Phillips, Ogden Martin Systems Inc.

**NIMIC** — Not In My Insurance Company. "When a community rises up to fight a radioactive-waste dump, they're branded hysterical housewives," says Brian Lipsett. But when an insurance executive refuses to underwrite a pollution-liability policy for the same dump, for the same reasons, he's credited with sharp business acumen.

Source: Brian Lipsett, CCHW

**NOPE** — Not On Planet Earth. In cynical moments, when the NIMBY syndrome gets them down, this term is muttered by waste handlers convinced that NIMBYites don't want disposal facilities sited anywhere.

Source: Roger Schrum, Ashland Oil Inc.

**PICESP** — Put It In Corporate Executives' Swimming Pools. In fevered moments, this term is proffered by vengeful radicals who think Dean Buntrock's swimming hole presents a dandy dumping option. (Mr. Buntrock is CEO of Waste Management Inc., the big trash-disposal firm.)

Source: Brian Lipsett, CCHW

**NIMFY** — Not In My Front Yard. If NIMBYism is taken to its extreme, and there are no more garbage pickups because no one will accept new recycling facilities, landfills, or trash-to-energy plants, NIMFY is what we'll all be crying as we watch our waste pile up.

Source: Bill Koch, Laidlaw Inc.

— Bill Breen





tor use and regular tilling [every few days] has been great. We just don't get complaints anymore."

As we headed back to the office, I spotted my photographer on top of the belt press building. "What's he doing up there?" asked Brett.

"Shooting the sunset, what else?" I answered, my sandals squeaking.

— Paula Huston

**To order fly predators, contact:**  
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*A resident of Arroyo Grande, California, Paula Huston makes educational videos on sustainable farming. She also teaches fiction and technical writing at Cal Poly State University, San Luis Obispo.*

## • Beachy Clean

In a startling upset, Louisiana catapulted past defending champ Texas to take top honors in the latest Center for Marine Conservation beach cleanup. Pelican State beachcombers collected 250,000 pounds of debris from just 76 miles of beach, which works out to 3,289 pounds of trash for every mile of beach—double last year's average.

This doesn't mean the beaches are twice as trashy, says Louisiana coordinator Barbara Coltharp. There were simply

twice as many volunteers as the year before. "Now the oil companies [whose 4,500 oil rigs are off the Louisiana coast] have banned [polystyrene] and plastics on the rigs," says Ms. Coltharp. "Lots of them have employee picnics on cleanup day. We work four hours and [then] party."

## • Presidential Panels

This fall, the solar panels that heated dishwater for two presidents will provide steaming showers for students at environment-minded Unity College in central Maine.

The Carter administration put the 32 panels on the White House roof. When the roof needed fixing, the Reagan administration took them down. The Bush administration never bothered to put them back up. Greenpeace and a letter from Jimmy Carter helped Unity rescue the panels from indefinite storage.

## • Flight Rights

"At first glance, it's hard to believe that a one-pound seagull can damage an airplane."

So writes the U.S. Department of Agriculture, announcing a \$1.9 million study of collisions between birds and planes—each year leaving up to 1,500 dead birds and \$25 million in damages to airplanes. Complaining that gulls are on the increase, the agency is studying scare tactics, "environmentally safe

chemical repellents," and a policy of siting landfills far from airports.

## • Don't Dump on ME

In the beach community of Wells, Maine, tourists' garbage violations are handled from the top. If a bag of household trash is found in a public barrel, employees search it for an address, which they take to Town Manager John Carter. Mr. Carter composes a pleasant, personal note asking the summer guests to properly dispose their garbage if they vacation in Wells again.

So how does someone "from away" do the right thing when tossing their trash? They pay about \$5 (per collection) for a private carter who's licensed to dump at the Wells landfill. Otherwise, they get a \$100 fine for repeatedly putting it in the dumpster.

## • Greywater Gets Respect

Regular GARBAGE readers know about "greywater"—the waste water from sinks, washers, and showers, which can irrigate your lawn or garden. Public-health officials worry that gallons of greywater coursing through the vegetable patch might transmit infectious diseases, so the practice is illegal in most of the country.

But the Los Angeles area is so parched that local officials are giving greywater serious attention. A proposed L.A. County ordinance would authorize a system similar to a septic



## FOR THE RECORD

*"Someone could make a killing [marketing] a biodegradable Bart Simpson condom."*

Roper executive Tom Miller, commenting on a nationwide survey showing that environmentalism, safe sex, and *The Simpsons* are "in."  
(Sierra, May/June, '91)

tank leachfield (but much closer to the soil's surface) for deeper rooted ornamental trees and shrubs.

Meanwhile, city researchers are studying different systems that may permit less restrictive regulations. Two California counties have already legalized greywater, says Bahman Sheikh of the city's Office of Water Reclamation, "and there

have been no outbreaks of cholera, or even minor aches and pains."

## • Garbage Cubes

It may lack the grace of origami, but squashing garbage into a one-yard, one-ton cube can substantially increase a landfill's life span. A Japanese company is doing a booming business with the "Tekkaseki" machines, which churn out large garbage bricks

that can also be coated in cement and used in construction. Another advantage: It squeezes moisture from wet garbage, cutting leachate levels once the stuff is buried.

Using spike-wheeled, garbage-crushing bulldozers, conventional landfills can cram in only about 1,300 pounds per cubic yard, according to *Waste Age* magazine. Even so, Japan's high-tech innovation for low-tech garbage compacting hasn't yet grabbed landfill operators in the U.S.

## • Busted for a Bottle

San Clemente, California. In the city that Nixon made famous, homeless people with the effrontery to swipe bottles and cans from curbside recycling bins face a \$50 fine.

It's not the dumpster diving that bothers city officials. What really bugs them is that divers may be toting precious recyclables to other towns, where they can get a better price. San Clemente has recycling goals to meet, so it passed an "anti-scavenging" bill to reduce competition from freelancers.

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# Reclaiming Cat Country

Ten years ago, Michael Tewes trekked across the vast nighttime landscape of south Texas, searching for wild ocelots. After five months of tracking through the thorny brush that hugs the Rio Grande Valley, he live-trapped an ocelot in March 1982. Since then, he's done his best to find, study, and protect the enigmatic cats. But in the U.S., only about 80 to 120 survive.

Some biologists believed that these sinuous, slender cats, which once roamed from Arizona to Arkansas, had vanished forever from the U.S. Dr. Tewes, a research scientist at Texas A&I University, found otherwise. Now, he's charting their main threat, one that's familiar to all endangered species: loss of habitat. Thickets of mesquite and amargosa provide ideal camouflage for hiding and for hunting rodents and rabbits. From the air, Dr. Tewes discovered that

nearly 98 percent of south Texas' thorn forest has been paved over or plowed under. The rest has been bulldozed into fragmented "islands," exposing the remaining cats to their greatest enemy: vehicles hurtling down backwoods roads.

The challenge is to cobble together enough habitat for the population to expand. (One cat typically ranges over 15 sq. kilometers.) To do this, Dr. Tewes and co-workers are returning farm fields to thorn shrubs. On a pilot plot of 250 acres, workers are planting 25,000 seedlings of species such as ebony and hackberry for nesting structures, and granjeno and fiddlewood for cover.

The project may become a springboard for transforming larger chunks of farmland into prime ocelot habitat. Meanwhile, many Texans are pushing to protect what's left. Says Michael Tewes, the cats can't recover without *natural* habitat.

— Bill Breen

**Biologists Michael Tewes (right) and Daniel Navarro fit a sedated ocelot with a radio collar for tracking.**



DANNY LEWIS





# VISIONARIES

## THE FUTURE OF GARBAGE

After 35,000 years, we continue to deal with trash the same old ways: reuse it, bury it, or burn it. We'll probably sling it to Saturn in the not-so-far-off future. Introducing four garbage veterans who are pioneering down-to-Earth versions of the old solutions for getting rid of garbage.

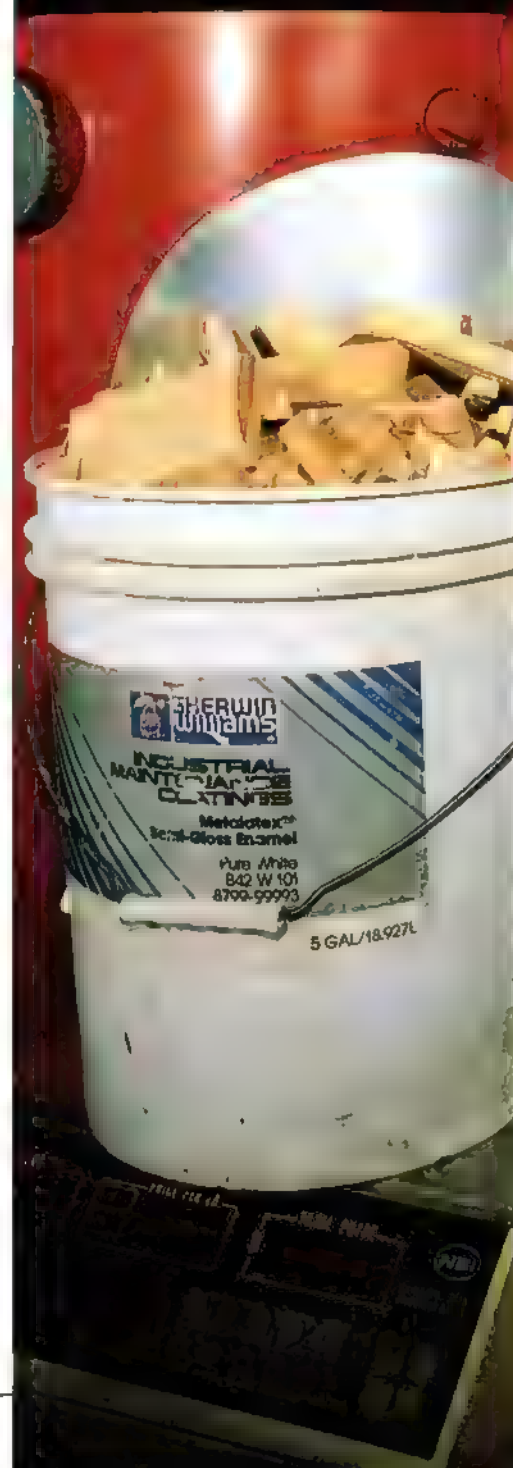
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WERP" read the gold letters emblazoned across Charlie MacArthur's cap. They spell a sounds-too-good-to-be-true solution to the garbage mess: a low-cost incinerator with a high-heat output that sends few pollutants up the stack or down the ash chute. Oops! excuse the word "incinerator."

"'Incinerator' is a dirty word because it's a dirty device," says Charlie. "What we've created is the TWERP — the Tralchemy Waste to Energy Recovery Project." With a former English major's delight in tinkering with the language, this homespun inventor has melded "trash" and "alchemy" to dub his patented garbage gobbler "Tralchemy."

It's a new twist on the old story of extracting gold (read energy) from trash. In the basement of his three-story

BY BILL BREEN





brick mill in the central Maine town of Sangerville, Charlie MacArthur says he's pieced together a better garbage burner. Last winter, it warmed 7,000 square feet of his uninsulated factory by burning domestic rubbish and \$200 worth of birch scraps. But if the Tralchemy stove is to get out of the basement and onto the market, it must first clear critical environmental and safety tests.

**A** 63-year-old Maine native, Charlie is a bedrock conservationist who's spent much of his life puttering with the properties of energy and motion. Fed up with feeding 80 cords of birch every winter into the great maw of his wood-stove factory's conventional boiler, he began brainstorming the principles behind TWERP.

"Welcome to the world's biggest toy store," quips Charlie as the back of his oil-stained welder's jacket recedes down a dimly lit stairway. His factory's cellar is crammed with cannibalized, or MacArthurized, bits of machinery and an array of tools for reconfiguring metal. In a shadowy corner stands the invention: a cylindrical stove, 48 inches tall, with pipes running to a storage tank that can hold up to 3,400 gallons of water for heating. Built with 11-gauge steel, it weighs 1,100 pounds.

Charlie empties a couple of five-gallon buckets of birch blocks into the fuel-feed tube that tops the stove, lights a crumpled newspaper, and drops it inside. He lugs over a bucket loaded with household trash. Down go corn cobs, an inner tube, disposable diapers. (He reports the stove previously reduced a gallon bucket of medical waste, a bowling ball, tire shreds, and

**In his Sangerville, Maine, factory, Charlie MacArthur has pieced together a trash burner that leaves just a trace of smoke and ash.**



## The stove reduced a bowling ball, tire shreds, corn cobs, and an aluminum plate to fine ash.

an aluminum plate to fine ash.) Fifteen minutes later, temperatures inside the fuel chamber are approaching 2,000 degrees Fahrenheit — within the range necessary for a clean burn.

The stove's innovation is its exact placement of oxygen, which enters from above, pulled by convection down a 16-inch tube. Heavier oxygen pushes lighter air and gases into a sealed, heat-reflective crucible. As the superheated air sweeps over the burning pile of wood chips and garbage, it forms a shield of flame that keeps temperatures high and gases from escaping. Most of the garbage goes poof, leaving a small pile of ash and the barest wisps of smoke.

"Conventional incinerators mechanically force air through grates located below the fuel, which is like trying to burn leaves in a hurricane," says Charlie. "This is the total inverse of a mass-burn incinerator. Essentially, the fire burns upside down." He motions to the fuel-feed tube. "Put your arm down in there — it's as cool as a cucumber." I believe him. I decline.

In Maine, you don't have to look far to find a small town that's been clobbered by soaring dumping fees — and scrambling to be the test site for a Tralchemy stove. I leave Charlie's factory, cross the street, and knock on Jim Catlin's door. He's Sangerville's town manager, and he tells a familiar story.

The state's Department of Environmental Protection wants Sangerville's cheesy, unlined dump closed by January '92. With new, tough regulations for constructing landfills, siting a new dump is out of the question. Trucking waste to an out-of-state landfill would probably cost more than incinerating at PERC — the Penobscot Energy Recovery Co.'s mass burner, which recently raised its dumping fees from \$10 to \$40 a ton. Coupled with mandatory recycling, the Tralchemy stove appears to be Sangerville's only low-cost option for getting rid of its garbage.

"The whole town is hoping that Charlie's stove works out," says Mr. Catlin. "All we've asked for is a chance to test it, but the DEP says it needs to be licensed first. So what's he got to do, have a college degree before he gets to go to college?"

To burn municipal solid waste, the Tralchemy stove needs to meet state air-emissions guidelines. It took Maine's DEP five months just to send him those guidelines. Frustrated by bureaucratic entanglements, Charlie shipped a unit to New Brunswick, Canada, to determine whether stack gases meet Maine's standards.

"If this Kitty Hawk contraption of canvas, stick, and wire is ever to become a 747, we need the state's cooperation," he grumbles. "But the DEP discourages innovation. Lawyers depend on precedent — on what worked before. They don't know a thing about new technology."

After a year of wrangling, state environmental regulators are going to let Charlie test his stove, sort of. The environmental agency has agreed to a trial run — a Tralchemy stove will burn Sangerville's nonrecyclables for 360 hours, at the rate of 500 pounds per hour. That way, garbage-squeezed towns will learn whether the TWERP will fulfill its promise to burn efficiently. And it won't spew pollutants or drop a lot of ash, right Charlie?

"Hey, some people think I'm a snake-oil salesman because it sounds so good," says Charlie. "But if the damned thing pollutes, I'll be the first to shoot it down."



## Let it Rot

Perhaps the easiest way to find a 17-year-old bagel or a 33-year-old basketball is to dig into your local landfill.

Interred organic waste is supposed to biodegrade. Sometimes it does. Often, it doesn't. N.C. Vasuki is trying to change all that.



**N.C. Vasuki has designed a Delaware landfill that recycles itself — by recirculating moisture through buried trash.**

moisture through the landfill will wash nutrients to thirsty bacteria to help them chomp garbage. Unlike their brawny, *aerobic* (oxygen-breathing) brethren, which seem strong enough to biodegrade a Buick, it takes three different kinds of *anaerobic* bacteria (the kind that live in oxygen-deprived landfills) to decompose a single sheet of paper. The weakened microbes inhabiting bone-dry, plastic-wrapped landfills need as many as 50 years to digest food scraps and grass clippings which otherwise take just one season to degrade — if you turn them in your compost pile.

"Recirculation keeps the bugs happy and cooking, reducing the degradation process [for organic wastes] to about ten years," says N.C. "Then we could excavate the landfill, put in a new liner, and physically reuse the same space."

**T**he concept of recirculating leachate was pioneered in the late '70s by Frederick Pohland, a University of Pittsburgh environmental engineer. In lab tests, Dr. Pohland found that soaking food and yard waste in naturally occurring bacteria results in about 90 to 95 percent decomposition. But it's difficult to transfer the process from the lab to the landfill. N.C. knows. He's been trying since 1980 — longer than any other landfill operator in the country.

He's been stymied by the tender loving care required by anaerobic bugs buried deep in a landfill's guts. Bacteria aren't stupid. They won't eat leftover weed killers or the lye in drain cleaners, so household hazardous wastes get concentrated when they eat other stuff. If there's too much toxic buildup, microbes die.

Another impediment: Moisture must wash over *all* of the bacteria, even the ones that are packed in crevices and layered in garbage. Inevitably, leachate streams get dammed by impermeable barriers like plastic trash bags and food wraps. As the landfill dries, biological activity slows.

N.C., a civil engineer and the chief executive officer of the Delaware Solid Waste Authority, is testing new ways to keep the bacteria in landfills feasting, and buried garbage decreasing. With a team of researchers and engineers, he's transforming the lowly landfill into a biochemical reactor that swirls moisture and bacterial microbes around garbage to speed its decay. To succeed, however, N.C. must buck the trend among environmental regulators for treating landfills as non-renewable embalming mounds.

"All of our technology has gone into designing these plastic cocoons," says N.C., a dapper gentleman with a martini-dry wit. "We call them 'LDDs — Lawyer-Driven Designs.' Delving through law books to save groundwater, lawyers have transformed landfills into permanent storage units and assured future lawyers

more business. What we *should* be doing is looking for ways to help the landfill recycle itself."

Tucked away in the pine woods of central Delaware, the Central Solid Waste Management Center looks like a typical landfill: Garbage trucks churn up dust clouds; a bulldozer-compactor crunches and spreads each delivery; sea gulls dive-bomb the smelly waste. What's unique here is what's occurring *inside* the landfill.

N.C.'s grey suit remains remarkably unmussed as he walks along the landfill's edge, tracing the leachate-collection pipes that carry percolating rainwater down through the landfill. Most operators pump leachate out of a dump and truck it for treatment at a sewage-disposal facility. But in Delaware, workers collect it in storage tanks and inject it *back* into the landfill.

N.C. believes that recirculating

ERIC CROSSMAN



**"Lawyers have transformed landfills into permanent storage units, and assured future lawyers more business."**

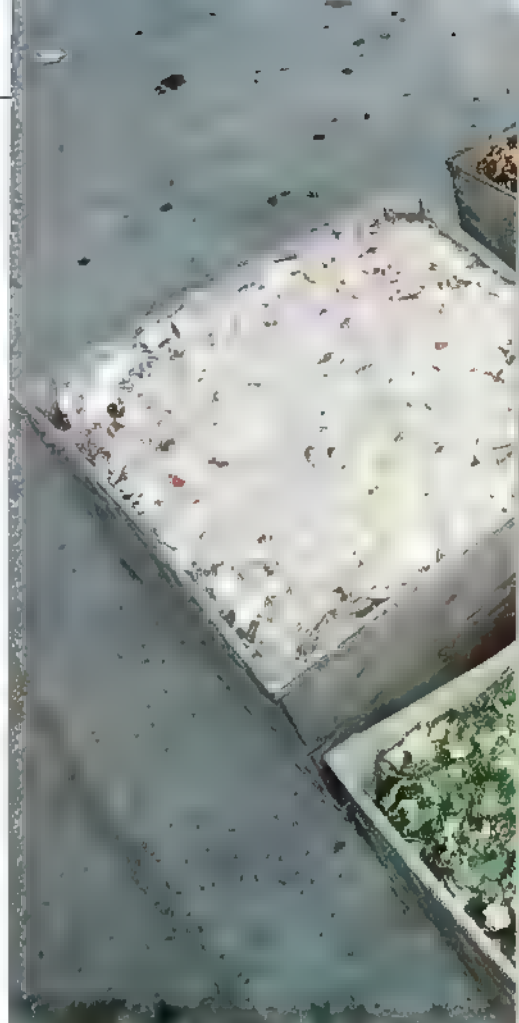
N.C. and his team tried nurturing microbes by spraying leachate across the top of the landfill. But the spray smelled sickly sweet, and ill winds blew some of the brew back onto unfortunate workers. Circulating the gunk through perforated, six-inch PVC pipes saturated the landfill. "But then the pipes got clogged with a kind of calcium encrustation," explains N.C. "We call them 'leachate stones.'"

To learn what leachate recycling can do under ideal but real conditions, N.C. and his staff designed a pair of one-acre test cells at the Central facility. The two mounds, grass-covered and crowned with a thicket of leachate sampling wells, were built with identical double liners and collection systems. Each cell contains 9,800 tons of garbage. In one cell, leachate is recirculated; in the other, it's removed. By measuring the methane belched by decaying garbage, engineers can track the degradation in both.

The tests should show whether it's wiser to soak landfills or wring them dry. The shape of future landfills hangs on such findings, because proposed federal regulations require that operators dry dumps by removing leachate and capping them with plastic liners to seal pollutants. "Dry" advocates favoring the new regulations fear that bloated landfills may leak and contaminate groundwater.

Psshaw, says N.C. He counters that recycling leachate can make landfills safer because it cuts the landfill's stabilization or decay period — where leakage poses the greatest threat — from decades to years. With a dry landfill, problems may occur after operators close it, cap it, and finally walk away. Later, the liner may crack, moisture enters, bioactivity starts up, and contamination becomes a real threat.

"We might be transferring to the next generation the very problem we're trying to avoid," he warns. "We should be spreading moisture more efficiently to get the bacteria to work for us. Unfortunately, some states already preclude this as an option. As a disposal manager, sometimes your goal is to get state permits, not push the state of knowledge."



## RIYBY — Recycling In Your Backyard

Supporting a power suit and toting a briefcase, Margaret Gainer all but hogties small-scale manufacturers and economic-development planners to talk garbage. And they're listening, because



**Delaware workers dig through degrading refuse to install new piping and a new liner.**



**On California's rural North Coast, Margaret Gainer is charting new ways to build new markets for recycling.**

just for the sake of recycling."

Six years ago, Margaret founded Gainer & Associates, an Arcata-based consulting group, to assist communities in developing recycling services. With help from her first client, the Arcata Community Recycling Center, she launched her plan.

**G**ainer & Associates' research team interviewed more than 800 manufacturers, industrial-equipment dealers, distributors, wholesalers, retailers, and specialists in new-product marketing. They analyzed manufacturing processes for egg cartons and hydroseed mulch, windshields and glass vases, juice jugs and PVC plastic. They charted the markets for products ranging from flat-glass to cellulose, animal bedding to tire retreads. Then they poured their findings into a 121-page blueprint for waste enterprisers, *Recycling Entrepreneurship: Creating Local Markets for Recycled Materials*. It's a model for jump-starting markets in California's North Coast — and every other part of the country.

The report highlights the real-world obstacles that recycle-based manufacturers must overcome. Consider old newspapers. Pulping and molding wastepaper into nursery pots or egg cartons could be successful on a small scale because the production process is relatively simple, and capital costs are low. But pulping is water intensive and the effluent is high in suspended solids, requiring costly cleaning equipment. To succeed, predicts Margaret, a manufacturer needs to grab a unique market niche, such as making molded pulp for packaging high-tech electronics.

"Manufacturers need to think more creatively about how to use the waste stream's resources in their production processes," Margaret explains. "When they make this connection, and I see

## she's uncovering revenue-making opportunities stashed in the trash heap.

While most recyclers are pushing the mega-mills (that manufacture glass, aluminum, paper, and plastics) to expand their recycling capacity, Margaret brings a "small is beautiful" approach to recycling. She's perhaps the first recycling professional to map strategies for helping small-scale industries create local markets for locally collected recyclables. "What she's doing," says Gary Petersen of Recycle America, a Los Angeles-based firm, "has never been done before."

It all began back in 1977, when Margaret became the executive director of the Arcata, California, Community Recycling Center. At the center, as mounds of cans and bottles and newspapers piled high, she scrambled to track down buyers. But Arcata, nestled among the redwoods that curtain California's rugged North Coast, is 250 to 600 miles from markets in Oakland, California, and Portland, Oregon.

Few towns expect to make money from recycling, but the cost of trucking low-value commodities over the long haul made it tough for Arcata just to break even.

Pondering this, Margaret got THE IDEA. Why not, she wondered, build our own recycle-based businesses from the bottom up, right here in our own backyard? They could detour the long road to markets and provide a useful afterlife for a mess of rubbish. They might even help revive the region's economy by creating jobs for unemployed lumberworkers and miners, farmers and fishermen.

Maybe that sounds a bit starry-eyed. But Margaret takes a hard-headed approach to the business of recycling; she didn't become a professional recycler because she thought she could save the planet.

"I got into recycling a little differently from the other old timers," she recalls. "Most of them started because they were concerned about the environment. I was attracted to recycling's community-development potential, and my environmental commitment followed. I don't like seeing recycling

GARY LYNN



the lights go on, I get out of the way!"

From Alaska to Arkansas, Margaret Gainer is lecturing and consulting — and talking up her safe bets for creating small-sized manufacturing ventures for local recycling markets. On California's North Coast, that includes processing used paper into cellulose insulation and hydroseed mulch; turning discarded bottles into glass blocks, tableware, and art objects; building scrap tires into breakwaters and docks, or molding the crumb rubber from tires into truck beds and bases for highway delineators.

Yet some of these proposals are low-value uses for recyclables, counters William Shireman, a recycling specialist with the Sacramento, California-based R.W. Beck & Associates consulting group. Slicing scrap tires to make rubber reefs doesn't begin to recapture all of the energy plus petrochemicals, rubber polymer, and steel which go into a high-value Michelin. Better end-uses would include burning them for fuel ("recycling up") or retreading ("closing the loop").

"[Breakwaters] might be a good place to start, but as you recycle you've got to raise the end product's value," says Mr. Shireman. "Otherwise, you're simply landfilling in a subtler way."

In a tough business climate, where lofty environmental goals must be balanced against the bottom line, low-tech recycling is preferable to no-tech. Margaret's study reports that the North Coast market for retreads is declining. And burning scrap tires requires hefty start-up costs and expensive sprayers and scrubbers for cleaning air pollutants. So if the humble breakwater can boost the local market for scrap tires, maybe higher end-uses will follow.

"Our challenge is to bring new innovators into the field: economists, manufacturing entrepreneurs, and repair technicians," says Margaret Gainer. "I'm out there waving my arms and saying, 'Hey, let's look harder at recycling.' Recyclers can't continue talking only to themselves."

# The Thousand-Year Garbage Man

**T**here are two ways to bust the nutty notion that a country as vast as the U.S. is running

out of landfill space. You can fly from Los Angeles to New York, gaze down, and take in all the wide open spaces. Or you can visit Charlie Miller's Perdido landfill in western Florida's backwoods, hard by the Alabama border.

Spread across 1,000 acres of rolling hills, Perdido's landfilling, recycling, and composting operation is managed well enough for Escambia County folks to get rid of their trash till the next century's close. They've even conserved extra land for building artificial wetlands, which pull pollutants out of collected landfill leachate.

Charlie Miller, Escambia County's blunt but affable solid-waste director, holds that municipal waste is best managed by recycling what you can and burying the rest. The concept is pretty straightforward. The innovation here is Charlie's combination of different treatment systems for gob-

bling big chunks of the waste stream. Call it integrated waste management. Garbage pros from as far away as Japan and Australia have dropped by, just to see how he does it.

"We can be as esoteric as we want, but we can't afford any fluff because this county doesn't have a lot of money," says Charlie. "We had to tin-cup \$7.5 million to build this entire operation." (While other Florida operators spend up to \$300,000 an acre to build a lined landfill, Perdido's 100-acre landfill — built according to hazardous-waste specs — cost just \$73,333 an acre.)

Each day, 25 percent of Escambia County's waste stream is dumped by trucks on Perdido's concrete tipping floor. Every ounce of the 250 tons of discards that arrive here daily is reused. (Trucks hauling an additional 800 tons from restaurants and industries that churn out contaminated, unmarketable refuse are flagged to the landfill.)

Charlie and I walk into the tipping shed to find a front-end loader scooping buckets of trash stacked 30 feet high. It wheels, beeps, and pushes the stuff onto a moving belt that conveys 30 tons every hour past gloved and goggled pickers who pull cardboard,





**To strain his Florida landfill's juicy refuse, Charlie Miller (right) built marshes modeled on nature's purifying powers.**

three colors of glass, PET and HDPE plastics, aluminum, and steel for recycling. Homeowners don't have to bother stacking newspapers or separating bottles from cans. Why not? Charlie's bass booms above the racket of machinery. "We don't want people presorting recyclables, because only 25 percent of them will do it right. The rest just screw us up."

Perdido also collects tough-to-recycle stuff. "White goods" like refrigerators and washing machines are sold to an auto shredder who strips and reclaims the ferrous metal. Used oil is sold to re-refiners. Concrete debris is crushed into gravel for Perdido's walkways. Scrap tires are ripped into chips for subgrading Perdido's new roads.

All of the stuff that doesn't get picked — tree limbs, wax paper, glossy magazines, food scraps — tumble into two shredders. Super blades grind the mass into two-inch bits, which will be dumped and spread into windrows for composting. Yet suppose a Coke bottle or milk jug slips into the shredder?

Not to worry, says Charlie. He doesn't care about the quality of the compost because he'll use it as "landfill cover" — the layers of dirt used to

blanket freshly deposited garbage. "With landfilling, you don't run out of space, you run out of cover material," he says. "Now, we've got a steady supply of cover, and a ready market for our own compost."

**A**s Charlie and I jounce around the landfill in an old Army jeep, a hard rain pelts the red, clayey earth. From this past January through July, western Florida was drenched with 70 inches of downpour. Small wonder that each day 10,000 gallons of rainwater flush from the landfill into a lake holding 30 million gallons of chemical-contaminated leachate plus septic-tank waste. ("The wastewater is sucked from clogged septic tanks and trucked to us, and it's a nasty nightmare," says Charlie.) To strain the landfill's juicy refuse, Charlie recruited scientists from the University of West Florida's Wetlands Research Laboratory, who built a series of marshes modeled after nature's own purifying powers.

"There are a few places using artificial wetlands for purifying sewage," says Charlie. "We're among the first to use them for treating landfill leachate."

The process begins in the 30-foot

depths of the pond, where a grid of aerators, churning up plumes of green foam, pump in oxygen to break down the heavy loads of waste. The wastewater is piped uphill to a second aerating pond. The effluent will be sprayed on composting food and yard waste to speed degradation (when construction of the composting area is completed), and the runoff will be channeled into the man-made marshes for purifying. For now, it's all piped directly into 12 lagoons planted with cattail and pickerel weed, bulrush and canary grass.

The submerged, fleshy stems of these hardy weeds are nests for scads of bacteria that feed on the nutrients in wastewater. The plants also supply oxygen, priming microbes for their aerobics — the tough job of digesting and burping ammonia from decaying paper and even trace levels of toluene from paint thinners and benzene from cleaning fluid. Charlie reports that this man-made yet "natural" purification process is reducing pollutants from 30,000 to 62 BOD (biological oxygen demand, an artificial measure of the amount of oxygen required for eliminating organic pollutants). Once it works its way through the weeds, the clear, filtered water is used for irrigating the capped, grass-covered portion of the landfill.

I lob a softball question to Charlie. "Are you a visionary?" He scoffs at the notion. He prefers to tag himself a "practical environmentalist."

"A lot of what we're doing here is the same old hat, we're just wearing it a different way."

In the cause-and-effect world of garbage management, though, I know this guy's got ideas for the future. Charlie Miller can't contain himself. He outlines his thousand-year landfilling plan — a 1,500 acre mountain that will scrape the sky at 700 feet! I'm half-inclined to believe him. He can probably keep us landfilling and recycling till we can blast the stuff to Krypton.

BILLY GRANGER





EPA  
shuts you  
down!  
**GO BACK  
12 SPACES**



Double  
line it for  
nonrecyclables  
and ash left  
after burning.  
**Dump 3**

Sorry, the  
price of  
newspaper  
just crashed!  
Bury it all.  
**TAKE 3**

## THE RULES:

Each player starts  
with 20 pieces of  
"garbage" (coffee  
beans will do). Leave  
a common garbage  
pile to go to when  
you "take" or  
"dump." Cut out a  
marker (see the outer  
edges of the board)  
and take turns rolling  
one die. Advance  
your marker  
according to your roll.  
The first to dump it  
all wins!

Plant a  
garden.  
**DUMP 5**



Oops! Moldy  
cream in  
your travel mug  
signals death of  
convenience.  
**TAKE 3**



Tap  
and clean  
methane  
to make  
electricity.  
**DUMP 4**

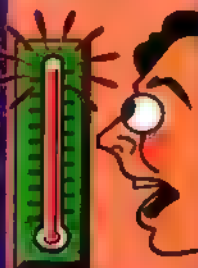
Face it,  
it's gonna  
leak.  
**TAKE 2**

**DUMP 5**  
**As You**  
**CROSS THE**  
**START LINE**



Bonus  
for cautious  
start.  
**DUMP 5**

Produces  
methane, a big  
name in  
global-  
warming gases.  
**TAKE 4**



## THE NEW GAME OF INTEGRATED WASTE MANAGEMENT

The old game was "put it at the curb and watch  
it disappear." And some of your friends still  
may be playing "pick the perfect option,"  
hoping to win the jackpot by landing on the  
elusive final solution to getting rid of garbage.  
But the players who've been playing the  
longest know that the name of the game is  
really "integrated waste management." It ain't  
easy, but it's the only game you can win. See  
for yourself!



Rathje's great  
granddaughter  
can still dig  
dumps.  
**DUMP 3**

Pay  
neighboring  
town \$1  
million to  
host landfill.  
**TAKE 3**



But ...  
recyclable  
paper makes  
good  
electricity!  
**TAKE 3**

Incineration  
makes a little  
electricity, which  
pays for a little  
incineration.  
**DUMP 2**

Junko Inc.  
introduces  
disposable  
beach towels.  
**ALL PLAYERS  
TAKE 5**



Fly ash coats  
the neighbor-  
hood; higher  
car-wash and  
doctor bills.  
**TAKE 5**

Reduces garbage  
volume by 80%.  
But concentrates  
toxics.

**MOVE BACK 5  
THEN DUMP 5**

Skip a turn  
while the  
health  
impacts are  
studied

**INCINERATION**



Less packaging  
between you  
and that toaster  
pastry.

**DUMP 5**



Lower  
garbage  
bills in  
the far,  
far future.  
**DUMP 2,**  
dreamer

A fridge that's  
built to last 40  
years (that's 40  
years of avo-  
cado green).  
**DUMP 3**



National Enquirer  
returns as toilet paper.

**DUMP 5**



Dedicating  
your kitchen to  
bins, you  
divert 80% of  
your garbage.  
**DUMP 5**



Extra room,  
more life for  
the old  
landfill.  
**DUMP 4**

**TAKE 5**  
OR LOSE A  
TURN

"Sniff sniff ...  
Honey, did you  
rinse that  
tuna can?"  
**TAKE 1**

**ROLL  
AGAIN  
OR  
DUMP 3**

"Pssst. Wanna  
buy 40 tons of  
reeking milk  
jugs?"  
**TAKE 3**



## COMPOSTING



Kitchen clog-  
ged with  
recyclables. Do  
take-out, then  
deal with the  
disposables.  
**TAKE 1**

Pay neighboring  
town  
\$1 million to  
host incinerator.  
**TAKE 3**



Toxic  
tomatoes!  
Shouldn't  
have com-  
posted those  
batteries.  
**TAKE 4**



from GARBAGE  
Graphic Design by  
Scott MacNEILL

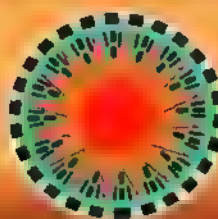
Smells  
good.  
**ROLL  
AGAIN**

Last winter's  
fruit cake is this  
spring's garden  
mulch.  
**DUMP 5**

You didn't  
follow the  
directions, and  
your neighbors  
sue.  
**TAKE 1**

A whopping  
30% of your  
waste taken  
care of!  
**DUMP 3**

City's compost  
is fit only for  
golf courses.  
City is buried  
by the rest.  
**TAKE 3**





# A PETROCHEMICAL PRIMER

If you were to purge petrochemicals from your life, as many natural-products devotees exhort you, chances are you wouldn't have much of a life left. Anything to do with computers, machinery, or post-war technology involves petrochemicals. Unless you're living primitively in the woods, you're surrounded by petrochemicals — no matter how ecologically conscientious you think you are.

Take Mr. Natural, a magazine graphics artist in his mid-30s. Though not an eco-purist, he strives to do the right thing. We'll follow him through a typical morning as he gets ready for work. Every time he comes in contact with a product that contains petrochemicals, or conducts an activity made possible by them, it will appear in *bold italics*. (Because it's ubiquitous, we won't even count most of the plastic.) By the article's end, you'll know the petro-elements of each bold-italic word. Your discoveries may upset you as much as learning what's in a Twinkie. And you'll never look at your lifestyle the same way again.

Mr. Natural wakes to the *alarm clock* with an upset stomach and headache from last night's spicy Chinese meal. Even so, a smile crosses his face as he remembers the late-evening *rendezvous* with Ms. Natural. Rolling into the impression she left behind in the futon that still whispers of her *perfume*, he flings off the *sheets* and stumbles into the bathroom. After a quick *gargle* for some serious morning breath (he's glad she had to leave early) and *teeth brushing*, he zips through a quick *shower* and *shampoo*. A glance in the mirror reminds Mr. Natural of the side effects from last night's indiscretions. He downs an *aspirin* plus a few vitamins. Then he dabs some *antiseptic* on a cut. After grabbing a *to-go container* of Chinese food and a whole-wheat *muffin* from the refrigerator, he runs for the *bus*.

Chances are, if an item in daily life is not derived from petroleum, it's made possible by it. Manufacturers may claim a product is made from natural materials such as coconut oil, but it's likely the *process* which turns that substance into a consumer item — like transforming tropical oils into sodium lauryl sulfate, an ingredient in Mr. Natural's "natural" soap and shampoo — comes in direct contact with petrochemicals.

If you want to purge petrochemicals from your life, the odds are obviously against you. We must live in harmony with at least some of them. Yet we know little about petroleum and how it metamorphoses into a plethora of products. That's a shame. Knowledge is power. Let's get to know petro.

*Refinery folks tell me privately that it's best for a scientifically illiterate public not to know about petrochemicals — it may spread fear among the masses. Maybe — but at the very least, the curtain to this backstage Oz should be drawn aside. Only then will we understand and take responsibility for the technology in our daily lives. — A.M.*

BY AMY MARTIN



**U**NLESS YOU'RE LIVING PRIMITIVELY IN THE WOODS, YOU'RE SURROUNDED BY PETROCHEMICALS ... ANYTHING TO DO WITH COMPUTERS, MACHINERY, OR POST-WAR TECHNOLOGY INVOLVES PETROCHEMICALS.





### It's a Mod, Mod, Mod, Mod World

To know petroleum and its petrochemical kin, you must first get intimate with them on an elemental and molecular level. Petroleum, the fossilized remains of once-breathing primeval sea creatures captured and cooked under pressure between layers of rock, is almost purely a hydrocarbon, an organic compound of the elements hydrogen and carbon.

To create Mr. Natural's petrochemicals, the hydrocarbons of petroleum must be atomically manipulated. An atom features a positively charged nucleus surrounded by one or more shells of negatively charged electrons constantly moving in all directions. Similar to their human counterparts, atoms and molecules bond for better or worse by giving, sharing, and sometimes stealing electrons. Carbon is rather randy as elements go, bonding readily with just about anything and un-

coupling just as swiftly. Unique in elements, it can bond extensively with itself to create hydrocarbon compounds with a core over 70 carbon atoms long, much of the reason for petroleum products' strength and seemingly eternal life span.

Atoms everywhere are engaged in constant barter to find some situation where they feel stable — until, as in the case of petroleum refining, someone intensifies the heat and stirs the mass up. You create a new compound by mixing elements like hydrogen and carbon. You can also spawn varieties by changing the *ratio* of hydrogen to carbon; the petroleum gas propane has twice as much carbon to hydrogen as does methane, which is less valuable. Add other elements and the birthrate explodes, sometimes literally: Toluene, a hydrocarbon found in both petroleum and the *Tolu balsam* tree, plus nitrogen and oxygen equals trinitrotoluene — TNT.

### Passion at the Refinery

Molecules of hydrogen and carbon are like Mr. and Ms. Natural. They react to each other (especially when under intense heat and pressure) like us Southerners before a summer storm, when tempers and passions become unbound. Mix two types of molecules together in the presence of a catalyst and the reactions intensify like a lovers' triangle. In the ensuing conflagration, the two molecules' old identities are consumed in the reaction. Irrevocably changed, they're left to build themselves back an atom at a time while the catalyst escapes unscathed. (There was a catalyst in my life once. His name was Chris. Sigh.)

At the refinery, distillation and other processes chemically liberate gases, gasoline, fuel oils, lubricants, coke, and a cornucopia of petrochemicals from crude oil. Crude is subjected to heat, pressure, and the ever-dramatic catalysts, recycling over and over while molecularly deconstructing and reconstructing, evaporating and condensing, until finally the barrel of crude is completely used, leaving behind a little left-over oil, a lot of waste products, and in the nearby communities a legacy of air- and water-borne pollution. *Every Superfund site is petrochemical related.*

Though occurring on the most diminutive of levels, this molecular magic requires gargantuan edifices. The refinery complex, acres of pipes, platforms, and domed towers entwined with metal latticeworks, is dominated by a distillation tower over 150 feet tall. It all looks quite a bit like sci-fi descriptions of 21st-century Los Angeles, a sprawling metal and concrete complex devoid of all greenery, subtlety, and silence, luminous even at night, in motion 24 hours a day, every day. Refineries range from tiny tea kettles pumping out a few thousand barrels daily to billion-dollar behemoths with half a million barrels a day flowing through 1,000 miles of pipes.

This petropolis isn't just an oil refinery. It's also a chemical quarry. Over 90 percent of all organic

chemicals (compounds based on carbon, hydrogen, nitrogen, and oxygen) originate here. The refinery itself produces mainly intermediates (material feedstock), most importantly ethylene and benzene, which chemical facilities refine further. Excepting metals and plant and animal matter, this amounts to just about everything used in industry, agriculture, and manufacturing.

### **Making & Breaking Molecular Architecture**

The petroleum-to-petrochemical transformation at the refinery, as outlined in Robert O. Anderson's book *Fundamentals of Petroleum*, involves four basic processes: *PHYSICAL SEPARATION*, *BREAKDOWN*, *CHANGE*, and *BUILDUP*.

After inorganic salts, trace metals, and other contaminants are filtered from piped-in crude, the first step is *PHYSICAL SEPARATION* into gases, fluids, and solids by a high-tech distillation process. Heated to 700 degrees Fahrenheit, petroleum vapors are collected as gases, or cooled and condensed back into liquid. Various types of hydrocarbon compounds locked within crude now separate by gravity into their newfound, physical characteristics.

Petroleum gases, primarily ethane, propane, and butane, float to the top of the distillation tower. (Under just the slightest pressure and refrigeration, propane and butane go fluid, earning their official moniker LPG, liquified petroleum gases.) Propane goes out for heating and other uses such as Mr. Natural's energy-saving gas stove and the less-polluting buses his progressive city uses. On the low end of the gravity spectrum, the heavy bottoms ooze into asphalt or bitumen, the first petroleum product ever used (for blacktopping roads). The rest includes waxes, lubricating oils, and really rank residual fuel oil.

Freed of the high- and low-end hydrocarbons, the middle distillates are left. Henceforth, the refinery's overriding goal is to extract the maximum amount of gasoline (and therefore profit) from a barrel, currently about 50 percent. The petrochemical industry developed as a direct result of trying to find something lucrative to do with most of the other half.

**THE REFINERY'S GOAL IS TO EXTRACT THE MAXIMUM AMOUNT OF GASOLINE (AND THEREFORE PROFIT) FROM A BARREL, CURRENTLY ABOUT 50 PERCENT. THE PETROCHEMICAL INDUSTRY DEVELOPED AS A RESULT OF TRYING TO FIND SOMETHING LUCRATIVE TO DO WITH THE OTHER HALF.**

### **Let's Get Cracking**

The *BREAKDOWN* processes at the refinery entail ways to make lighter gas and gasoline from heavier gas oils. That means cracking long hydrocarbon chains. How do you do that? Just like you crack up people: put them under heat and pressure in confined circumstances for a period of time. Petroleum is tough stuff. It withstands up to 1,000 degrees Fahrenheit and up to a ton per-square-inch in the now-outdated thermal-cracking process.

Pass the petroleum over reactive catalysts, from activated zeolite clay to platinum, for catalytic cracking, and both the temperature and pressure can be reduced. Switch from clay to platinum catalysts while in the presence of hydrogen gas — hydrocracking — and the temperature needed (500 to 800 degrees Fahrenheit) drops, so efficiency rises even more. But

so does the pressure required (from 1,000 to 3,000 pounds psi), making the hydrocracking tower for containing it one of the most massive structures on the planet. Cracking of all kinds is where most of the pollution from refining originates.

So far, the hydrocarbon molecules have remained loyal to the petro chain gang. Not for long.

The remaining material must be reformed through a variety of *CHANGE* processes. Catalytic reforming uses a hydrogen atmosphere, plus heat and pressures ranging from 280 to 28,000 pounds psi, to break long hydrocarbon chains into smaller saturated chains. Paraffins evolve into branched-chain isoparaffins for plastics and synthetic fibers. Naphthas turn into naphthenes which are then unsaturated (the hydrogen atoms removed) into the vacillating hexagonal rings of benzene's aromatic family.

### **Sweet Odor of Life & Death**

In 1825, the English chemist and physicist

Michael Faraday identified

benzene as a flammable component of whale oil. Yet until its molecular structure could be deduced, benzene couldn't be mastered. This obsessed a German chemist, August Kekule, who'd been experimenting with benzene found in coal tar. In 1865, he was commuting to work on a train, slipping in and out of sleep, when in a dream he saw a whirling image of a snake biting its tail: an ancient symbol, familiar to Jungians, of time and continuity of life.

Upon waking, Kekule realized that the molecular structure of benzene is circular, not in a long straight line like most complex hydrocarbons. Back at the lab, he proved his hunch correct. After more research he decided that the bonds between atoms were not single or double but something uniquely in between.

This paradox is the source of benzene's magical and murderous properties. Though unsaturated, a





benzene ring is stable with low reactivity. Yet being unsaturated, it is easy to bond with because the electrons are open to receiving other atoms. The six-cornered structure forms a versatile chassis that expands dramatically the variety of compounds a benzene ring can make.

Benzene, toluene, and the xylenes are the major hydrocarbon aromatics, a nice name for potentially nasty compounds. Why aromatic? Because their odors range from the sweetest of flowers — as in Ms. Natural's perfume — to the most indescribable yuck. Aromatics evaporate, which is an exemplary quality for the paints, inks, and adhesives Mr. Natural uses at work. Aromatics are also a central-nervous-system depressant. Their fumes are a key problem for those who are chemical-sensitive.

During all that catalytic reforming, a molecule may fragment and become radical. As

chemical reactions make molecules mutate from one state to another, sometimes they are temporarily something else: free radicals. Extremely active chemically, free radicals are incomplete molecules desperately trying to force anything they come in contact with to give or receive electrons, thereby causing the donor to become a free radical. (Vital to catalytic-converter engine function, this chain reaction is similar to the free-radical oxidation suspected as a major factor in cancer and aging.) Benzene grabs free radicals and snaps them on. Or it attracts ions (electrically charged atoms) of other elements like chlorine to create the chlorobenzene pesticides used to grow the wheat in Mr. Natural's muffin.

After being reformed into smaller, more malleable shapes, the processes are reversed to *BUILD UP* the molecules. Isomerization and polymerization are the basic techniques used

to link short-chain molecules into long, complex chains, mainly to create plastic and synthetic fibers. All the plastic in Mr. Natural's life was solidified, one atom at a time, from petroleum gases.

### Petrochemical Alchemy

Keeping these processes in mind, follow the bouncing prefixes and suffixes below to trace the transformation of benzene and other hydrocarbons into Mr. Natural's lifestyle. Not only will it expand your English, but you'll also be able to decipher some of the litany of chemical names on product labels.

★ Mr. Natural's **alarm clock** is a digital one with a computer chip. Although chips are silica-based, petrochemicals are required to layer the circuitry.

★ Much peace of mind was brought to Mr. Natural's **rendezvous** with Ms. Natural by the synthetic-latex condom he wore and its petrochemical spermicide, nonoxynol-9.

★ Most **perfumes** draw from the aromatics family to create at least some of their allure, including Ms. Natural's fine French scent.

★ Mr. Natural doesn't have to iron wrinkles from his **sheets** because of a formaldehyde-based crisping agent. Add oxygen to methane to create methanol; then remove two hydrogen atoms to make formaldehyde.

★ To **gargle**, Mr. Natural uses Listerine, which the *Illustrated Encyclopedia of Science and Inventions* says once boasted the antiseptic n-hexylresorcinol, a derivative of benzene's molecular cousin phenol. Manufacturers claim that for over 100 years, Listerine has contained only essential oils of thyme, eucalyptus, and wintergreen, as active ingredients.

★ Most **toothpastes** for **brushing teeth** contain as a preservative a touch of chloroform, which is created by adding chlorine and oxygen to benzene, and is kept pliable by glycerol (known to label readers as glycerin) made by adding three oxygen atoms to a propane molecule.

★ Though Mr. Natural uses "natural" products to **shower** and **shampoo**, they are full of petroleum extracts like the misnamed mineral oil, and petrochemicals like isopropyl (or rubbing) alcohol. Ethane is cracked into ethylene; hydrogen is then exchanged for a carbon-hydrogen molecule to form propylene, which is treated with sulphuric acid to create isopropyl alcohol. To make the sodium lauryl sulfate in the "natural" soap, shampoo, and shaving cream, coconut oil took a petrochemical bath.

★ Add oxygen to propylene to create propylene glycol, a cousin of glycerin used to retain the moisture in Mr. Natural's body-cleaning products; it's also in the antifreeze and hydraulic brake fluid for his bus.

★ Aspirin is just one of many pharmaceuticals derived from phenol. Add one carbon and three oxygen atoms to phenol and you get salicylic acid. Add two carbon and two hydrogen atoms, and one more oxygen atom to make acetylsalicylic acid, the proper name for aspirin.

★ Almost all antiseptics are petrochemical derived. The topical antiseptic Campho-Phenique contains 4.7 percent phenol, which can be modified into creosol found in Mr. Natural's Lysol-brand bathroom disinfectant.

★ To make the plastic for Mr. Natural's polystyrene **to-go container**, benzene is added to ethylene to form ethylbenzene. It undergoes a free-radical change process to convert it into styrene, which is polymerized into polystyrene.

★ For a finale, Mr. Natural's whole-wheat **muffin** is a powerhouse of petrochemicals, starting with the synthetic-nitrogen fertilizer and the chlorobenzene-pesticide chlordane, used to grow the non-organic wheat. Propylene glycol keeps the muffin moist.

Synthetic vanilla, an ethane derivative, adds flavor. It's kept fresh with the hotly debated petrochemical preservative BHT. Mr. Natural could have chosen a sugar-free muffin made with the petrochemicals saccharin, sorbitol, or aspartame.

If we went into the petrochemicals Mr. Natural encounters at his graphic-arts job for a magazine, this article would be a book.

**PETROCHEMICALS DON'T REQUIRE PETROLEUM. IF YOU REMOVE OXYGEN FROM A PURE CARBOHYDRATE, SUCH AS THE CELLULOSE IN PLANT MATTER, YOU'VE GOT MUCH THE SAME HYDROCARBON — WITH LESS POLLUTION AND TOXIC WASTE. BUT WE CAN NEVER GO BACK ENTIRELY TO NON-PETROLEUM FEEDSTOCKS.**

#### **Too Valuable to Burn**

Petrochemicals don't require petroleum. They simply need hydrogen and carbon molecules, and petroleum provides an unusually rich supply. If you remove oxygen from a pure carbohydrate (carbon, hydrogen, and oxygen), such as the cellulose in plant matter, you've got much the same hydrocarbon — with less pollution and toxic waste.

But in so many ways, we can never go back entirely to non-petroleum feedstocks. It's now the Data Age, and the plastics and chemicals required for computers, and for much of the pharmaceuticals and diagnostic technology of modern medicine, are so exacting in molecular requirements that they will be formidable (though

not impossible) to replace. The wheels and gears of standard high-speed machinery simply can't function on easily degraded animal and plant fats.

Yet go back we must, at least part way, because oil is not limitless. According to the federal Department of Energy, we've got only about 40 years at current consumption rates until we must tap into even more ecologically devastating sources of hydrocarbons — coal, oil shales

and sands, off-shore and Arctic oil deposits — at exponentially increased financial expense. The Council on Plastics and Packaging in the Environment is typical of the petroleum trade groups which feel these sources, according to their information pamphlet, *The Origin of Plastics*, "may not be economically recoverable at current market prices, but would be if the costs of comparable fuels increased." In other words, whether it's crude or coal, consumers will simply pay up.

Others are not so sure. The American Chemical Society's high school textbook, *Chemistry in the Community*, raises the

question: Is petroleum for building or burning? By focusing on petroleum as a source of gasoline and fuel, we're already answering the question. We should be husbanding this limited but indispensable natural resource for vital non-fuel needs such as lubricants, computers, and medicine. And we might also ask ourselves whether it's worth the ecological and health risks to have sheets that don't wrinkle, shampoo that suds excessively, muffins that never go stale, and toothpaste that will stay eternally moist.

Amy Martin, a Dallas-based environmental writer, is a regular contributor to GARBAGE. Look for her article on petrochemical alternatives in our Nov./Dec. issue.



# GETTING RID OF **BATTERIES**

**CAN BATTERIES BE RECYCLED? MORE TO THE POINT, SHOULD THEY EVEN BE COLLECTED?**

**K**aren Odato lives in Randolph, Vermont, a town of 4,800. Peeved as heck about all the old batteries that get tossed "in the garbage" each day, she took action in December '90.

"It's just not fair that these corporations who make batteries are producing all this hazardous waste and the taxpayer ends up cleaning up after them," Ms. Odato says. So she placed boxes in 20 locations around town where people could drop off their batteries.

The town collected 311 pounds of old batteries. Then they separated them by manufacturer and shipped them back to their makers.

They got letters — mostly terse. But Terry Telzrow, manager of product safety at the Eveready Battery Company in Westlake, Ohio, penned a three-page tome that illustrates the convoluted problem of collecting and recycling batteries in America today. The letter said that since the town of Randolph had now declared their old batteries to be "hazardous waste," Eveready could not legally handle them because the company has no federal or state permit to serve as a hazardous-waste collection or treatment site.

"No matter what we would like to do as a responsible citizen, we cannot

accept shipments of used household batteries from you. We hope you understand our predicament," said Eveready to Randolph, Vermont.

That was February '91. Times are changing. Sanyo just introduced what it calls its "Mailback Recycle System," rechargeable nickel-cadmium (NiCd) batteries sold in a storage package that can be used to send the batteries, when worn out, back to Sanyo for recycling.

**T**he majority of heavy metals (lead, arsenic, zinc, cadmium, copper, and mercury) in the household waste stream come from batteries. Heavy metals are toxic and are currently associated with neurological illnesses and cancer.

"Do batteries have to contain those nasty heavy metals?" you ask. For those who slept through eighth-grade science class, I'll review some basics.

Batteries are divided into two classes: primary and secondary. Primary batteries (which include carbon-zinc, alkaline, mercury-cell, and lithium) are used once and thrown away. Hiss boo, you say? It's science. The chemical reaction that supplies current in disposable batteries cannot be reversed. So why are these substances used for batteries? Because they make disposable batteries that are economical, can be used in many applications, have a decent shelf life, and are reliable.

Conversely, secondary batteries (including nickel-cadmium, lead-acid, and nickel-hydride) are rechargeable because the chemical reactions that take place inside them are reversible. When



**While primary batteries can't be recharged, increasingly popular secondaries can (above). Sanyo is asking consumers to return dead batteries in new "Mailback" packaging (right).**

**BY RON GASBARRO**

you put a secondary battery in its recharger, you are fast-backwarding the flow of electricity. The active material that has been depleted is now restored.

So why don't we all switch to rechargeables? Well, rechargeables are more expensive — about \$10 for a 9-volt, over \$8 for a pair of AAs or AAAs, a whopping \$11 for a couple of Cs. Don't forget the recharger you'll need, from \$25 to \$60.

Also, rechargeables tend to run anywhere from one-third to one-quarter the time disposables do. When they lose their energy, they do so suddenly, unlike disposables, which lose energy gradually.

And then there's the cadmium issue. "In rechargeables, cadmium is a key component; [it's] what makes them rechargeable," says Kim Edwards, VP of marketing for Gates Energy Products in Gainesville, Fla. "We are developing a replacement for NiCd called nickel hydride that we hope to introduce in five to 10 years. But the technology is new and the price of the batteries will be two to three times that of our current rechargeables."

That's \$20 to \$30 for a battery, folks.

Unfortunately, what's good for the battery is not good for the body. Lead, for example, is resistant to corrosion and is used in storage batteries because of the ease with which it accepts and yields electrons. Yet it is one of the most hazardous and toxic metals because once in

the body, it can bioaccumulate — be stored in body fat and concentrate up the food chain.

Federal guidelines say a person should not ingest more than four micrograms of mercury per day. The standard C-size battery contains 16,500 micrograms of mercury. Obviously, it's not good if any of the stuff finds its way out of crushed batteries into groundwater, or out of incinerated batteries into the air.

Has anything been done? Well, yes, but only with a kick in the pants from Europe. Several years ago, the U.S. battery industry removed 90 percent of the metal from batteries. They did it because the European Community (EC) said the companies could not sell batteries overseas until mercury was reduced.

By 1993, all alkaline-manganese batteries sold in the EC must have less than 0.025 percent mercury (Hg) and cadmium (Cd) by weight or be prohibited from sale. (The exception is all button cells, which will bear the standard recycling symbol.)

Slapped with an EPA warning for high cadmium in their incinerators and mercury in the stack, Warren County, New Jersey, started a battery-collection pilot program in 1989, financed through their Pollution Control Financing Authority (PCFA). One year later, the program went county-wide, even though a grant from the state's Department of Environmental Protection fell through. "We were so concerned about

emissions that we went full scale with drop-off areas and curbside collections," says Mary Briggs, recycling coordinator for PCFA.

In this rural county of 94,000, they collect about 1,300 pounds of batteries per month. After collection, batteries are sorted into types: those to be reclaimed and those to be landfilled. The latter are disposed of (outside the county) twice a year. Since the program has been in place, the county's incinerator ash has not flunked the EPA toxics test for cadmium.

Yet proposed household-battery collection, separation, and recycling programs have downside health, safety, and environmental risks. Not everyone wants batteries collected. For example, the Iowa Department of Natural Resources and the California Department of Health Services have successfully opposed legislation to require source separation of household batteries.

Getting someone to buy (or simply accept) your community's old batteries is tricky, but such people do exist. Some leads: Alkaline, zinc-carbon, and gel-cell batteries can be buried in hazardous-waste landfills operated by Chem Waste Inc. in Menomonee, Wis. They also have a recovery facility for sealed lead-acid batteries.

NiCds can be sent for reclamation to Immetco in Elwood City, Penn. Mercury Refining Company (Mereco) in Albany, N.Y., accepts mixed button batteries. And lithium batteries may be shipped for incineration to TWI in Ensco, Arkansas.

*What with raised consciousness on the part of consumers, waste managers, and now battery manufacturers, we expect rapid developments in this area of hazardous-waste disposal; we'll update you as they happen.*

— the editors





# POLICE

# GREEN THE

## IN THE ENVIRONMENTAL HOLY WAR, WHO CAN TELL THE GOOD GUYS

**G**reen Cross and Green Seal have been dueling for our affections since each was announced. Each is itching to banish false environmental claims from the arena of "green marketing," and reward the good guys with a medal of honor. Each wants to be the protector we consumers look to when we're baffled by green pretenders.

They know we need help. If we were gullible, we might believe that everything from garbage bags to underarm deodorant and plastic coffee cups are good for the environment — some marketers tend to blur the line between "Earth friendly" and "slightly better than the rest of the crap."

In fact, you'd be hard-pressed to find any product that is purely good for the environment. Between the mining of its metal and the trashing of its plastic blisterpak, even a water-saving showerhead rings up an environmental price. Given the complexity of environmental impact, and the tradeoffs that attend every product we buy, can anyone sort out the environment's friends from its foes?

BY HANNAH HOLMES

ILLUSTRATIONS BY SCOTT MACGIBERN

FROM THE BAD GUYS?



mac  
neill



**"You've got to stick your neck out. And that's hard to do when people are taking pot-shots at you."**

— Denis Hayes, president of Green Seal



## CROSSES, SEALS, AND PROMISES

**G**reen Cross and Green Seal brought lifecycle analysis (LCA) to our collective attention when they announced they'd use it to sort out the true believers from the pagans. But can they be the environmental enforcers?

**GREEN SEAL BIT OFF MORE THAN IT COULD CHEW.** On June 14, 1990, Denis Hayes (Mr. Earth Day, remember?) announced that Green Seal would conduct a full-blown LCA for each family of products it planned to analyze — light bulbs, tissue papers, laundry cleaners, and house paints, for starters.

But LCA has proven beyond Green Seal's reach. It can cost hundreds of thousands of dollars to research the environmental impacts of a product from cradle to grave — extraction and transportation of raw materials, manufacturing, distribution, use, and disposal. Even then, there are big questions LCA can't answer.

So Green Seal has retreated a bit. It now plans to conduct a shortened version, calling it Environmental Impact Evaluation. (What did the Green Seal analyst say when her husband asked why she was tense? "It's that EIE I owe.") The review of a product category's lifecycle is then boiled down to a handful of standards a manufacturer must meet. Bathroom tissues, for example, must be made from 100-percent re-

cycled wastepaper and at least 10-percent post-consumer paper; toxic solvents can't be used to de-ink the wastepaper, and there are limits on bleaching of the tissue; the final product can't contain dyes, inks, or perfumes, and must be packaged either in bulk or in 100-percent waste materials.

But even this simplified method has taken a long time to design. Green Seal was slated to hit the stores early this year. Yet it wasn't until mid-June that we saw a *draft* of the standards tissue makers would have to meet to get the Seal.

Environmentalists, industry, and labelling pundits alike cut Green Seal some slack for proceeding with caution and for seeking public comment on its standards before it goes spreading Seals around. Still, criticism is easily had.

The short-cut approach to LCA is costing Green Seal some credibility. Tim Mohin, EPA's LCA point man, says his agency, too, would like to have a "streamlined" method, but notes, "We feel pretty strongly that we've got to figure out how to do a full-blown lifecycle analysis before we can simplify it."

Perhaps the most serious criticism of Green Seal is that it will appear to convey blanket approval in a world where environmental impact depends, to some extent, on where you're sitting. "The diaper issue is a classic one," says Bob Hunt, a vice president at Franklin Associates, Ltd., a firm that

## SCIENCE FOR SALE

**P**lastic has been getting some bad press. From a garbage point of view, it hangs around forever, it can't be composted, it's often made from evil, otter-sliming oil, and its manufacture creates some very toxic pollution. Yes, plastic has an image problem.

The Council for Solid Waste Solutions (CSWS), funded by the plastics industry, needed a solution. It needed to show the warm, fuzzy, good-for-nature side of plastic. So it hired Franklin Associates, Ltd., of Prairie Village, Kansas, to do two studies that would show just how great plastic is.

Franklin Associates, which does a

lot of these studies, performed what they call a Resource and Environmental Profile Analysis (REPA) on two different categories of products: polystyrene vs. bleached paperboard fast-food containers, and polyethylene vs. brown-paper grocery bags.

Using data whose sources weren't disclosed in the final report, Franklin produced a set of comparisons that boiled down, in the case of the food packages, to this: Polystyrene containers use 30 percent less energy (including the nonrenewable energy inherent in the plastic itself), produce 46 percent less atmospheric wastes,

has done nearly 200 LCAs. Cotton diapers use lots of water, and disposables take up lots of landfill room. Hunt explains, "In parts of California, they have 100 years left on the landfill, but they're out of water. In New England, they have plenty of water, but they're out of landfill space. How are you going to label that?" Green Seal has no immediate plans to evaluate diapers, but the point is well taken.

Denis Hayes, president of Green Seal, responds that anyone who hopes to help consumers must take a leap of faith at some point, given the fabulous cost of scientific analysis. "You've got to stick your neck out," he says. "And that's hard to do when people are taking pot-shots at you."

**GREEN CROSS: NOT CHEWING ENOUGH.** Green Cross has also done some back-pedaling. Its original symbol — a simple green cross — has been modified. Now when the seal appears on a product, a green cross and blue planet are accompanied by a descriptive statement, like: "This beverage container has been certified to be made of 50 percent recycled glass."

Green Cross denies its mark is an environmental seal of approval, although the logo argues otherwise. Green Cross president Stanley Rhodes explains that the symbol, which already appears on nearly 400 products, simply verifies a company's environmental claims. In other words, if a manufacturer meets minimum stan-

dards (10-percent post-consumer waste in the product or package, and an overall percentage of recycled waste which approaches the "state of the art" as defined by Green Cross), then as long as they're telling the truth about the percentage claimed, the company gets the Cross.

Now Green Cross is moving into lifecycle analysis. Statler Tissue is the first company to seek Green Cross's general seal of approval, as researchers try to contrast the cradle-to-grave pollutants generated by virgin and recycled paper towels. Co-founder Linda Brown says that Green Cross has stayed out of LCA because there is no basis for comparing pollutants that have wildly differing effects — "apples and oranges," she says. Yet Green Cross will now compare the pollutants from virgin-paper making to those from paper recycling, where ink wastes — an environmental albatross unknown in virgin-paper making — are a major concern.

The most common criticism of Green Cross is that it rewards recycling and ignores source reduction. Numerous brands of recycled paper towels and napkins have received the symbol, although such single-use products are inherently wasteful. A set of non-concentrated, exaggeratedly task-specific household cleansers (see *In the Dumpster*, July/August '90) got it. Bags made from 95-percent recycled plastic share the seal with bags made from 50 percent. Boxed Clorox

**"We feel pretty strongly that we've got to figure out how to do a full-blown Lifecycle Analysis before we can simplify it."**

— Tim Mohin, EPA's Lifecycle Analysis specialist.

bleach wears the symbol — the box contains recycled fibers. Scented garbage bags got it because they contain recycled plastic.

**IN SHORT, AN UPHILL BATTLE FACES BOTH PROGRAMS.** Many environmentalists worry that consumers will stop thinking and just reach for a symbol, ignoring things like regional impact, source reduction, and over-consumption. Furthermore, the cost of testing, research, and, in the case of Green Seal, a licensing fee, may mean some small manufacturers won't be able to

42 percent less water wastes, and 29 percent more solid waste than paperboard containers.

Near the front of the report that Franklin gave CSWS was the following disclaimer:

*"No attempt has been made to determine the relative environmental effects of these pollutants such as fish kills or groundwater contamination, as there are no accurate data available."*

In other words, the "environmental impact" that Franklin analyzed was simply the Btu's that went into each product, and the weight of the pollutants that came out.

Nonetheless, the Council whipped off letters to the media and to politicians, boasting about plastic's perfor-

mance in this "independent research." Some quotes, with emphasis added:

"The Council ... has released two comprehensive reports analyzing the *cradle-to-grave environmental impacts* of popular plastic products and their paper-based counterparts."

"Plastic sacks actually compare favorably with paper sacks in total energy use and *overall environmental impact*."

"Interestingly, both plastic products compare favorably to their alternatives in terms of ... *overall environmental impact*."

The campaign worked. The *Los Angeles Times* and *Forbes* magazine were among the media that parroted the study as proof that McDonald's had done the wrong thing when it

traded foam containers for a plastic-paper wrapper last November. Never mind that the new wrapper is so much smaller than a paperboard box that the Franklin study doesn't apply. We in the media are suckers for scientific-looking numbers.

It is this sort of public-relations foolery that's motivating researchers to come to an agreement on how LCA is conducted, and how it can be used. Otherwise, this "science" may become just the newest, most expensive Madison Avenue tool. Instead of baseless environmental claims, companies will claim environmental benefits on a pseudo-scientific basis that is extremely difficult and expensive to refute.



# Big industry intends to avoid the "pissing match" between Green Cross and Green Seal.

afford a seal, no matter how clean and green their products.

If the programs lack environmentalists' support, they're also failing to make allies of mainstream manufacturers, who want to avoid what one industry spokesman called a "pissing match between two organizations that don't have much credibility." Most large corporations are waiting for the federal government to regulate environmental labelling.

Green Cross president Dr. Rhodes does his share of sniping at Green Seal, but he knows it can't last. "We are about to get drubbed," he says. "This infighting between us and Green Seal is very destructive. [Big corporations] must be over there rubbing their hands together and saying, 'Great! We got 'em where we want 'em — fighting among themselves.'"

## GOVERNMENT TO THE RESCUE?

**D**on't hold your breath. Besides Green Cross and Green Seal, others are preparing a green crusade, not the least formidable being the U.S. Environmental Protection Agency (EPA). But it's going to be a while before anything useful comes of these battle plans.

**EPA:** A few of years ago, EPA proposed legislation to set up a quasi-governmental reviewing board that could issue a seal of approval. But seeing the trouble Germany and Canada were having with their national programs, EPA dropped the subject (see *Seals to Watch*, p. 49). Now the agency is going back to lay a foundation, spending big time and money on studies that will lay ground rules for doing LCA.

And the agency has a finger in almost every other pie that's baking, whether the subject is writing definitions for "recyclable," "recycled," and "biodegradable," or discussing label and seal concepts. EPA may be late out of the blocks, but if Congress gives it authority to administer a seal, it could catch up and take charge.

**FTC:** Green labelling is sometimes perceived as a marketing issue rather than an environmental one, partly because companies misuse environmental claims like "biodegradable" and

"Earth friendly" in their ads. Enter the Federal Trade Commission. With the EPA and the Office of Consumer Affairs, the FTC formed a task force to deal with environmental claims. In July, the task force held two days of hearings on such questions as: What do consumers need to know? What scientific process should we use to prove or disprove label claims? Do we know enough about the environment to set guidelines? Will Green Seal and Green Cross interfere?

Testimony from corporations, environmentalists, and consumers, will guide FTC in its policymaking.

**ASTM:** The American Society for Testing and Materials doesn't do stamps and seals, it does language. When someone asks ASTM to hash out an issue, ASTM convenes a committee of people from the appropriate industries, regulatory agencies, and consumer groups. The committee writes definitions that are then circulated widely in an effort to gain broad consensus. It's a formidable task, but once ASTM standards are agreed on, they're almost as good as law.

Currently, ASTM committees are working on definitions for degradability of plastics, recycled-plastic and recycled-steel terminology, and used oil, among other issues.

**NSF:** The mark of the National Sanitation Foundation is most often seen on food-service and water equipment. Like ASTM, NSF is really in the business of writing standards — when a product meets the standards, it can wear the NSF seal. Concerned with the proliferation of seals and standards, in 1990 NSF joined the fray. "As a marking program, we are concerned that the whole area will get a black eye from the groups that are jumping in without the weight of experience or consensus," says NSF researcher Gordon Bellen. NSF is working with other national and international standards-writing organizations to find definitions and methods that will be widely accepted. Although the Foundation professes a healthy distrust of environmental seals-of-approval, it may produce one to reflect its own standards.

## And a cast of thousands:

Various states and regional groups are also in the fray. Manufacturers



shudder at the thought of having 50 different seals and sets of standards, but given the leadership vacuum at the federal level, that's the direction in which things are headed.

## LCA SAVES THE DAY!

So where do we turn for guidance? In the mayhem that has surrounded green labelling in the past couple of years, there was one voice that sounded scientific and authoritative. It was the voice of Lifecycle Analysis — aka Lifecycle Assessment (recently), Resource and Environmental Profile Analysis (REPA), Ecobalance (mostly in Europe), and Product Lifecycle

Analysis (PLA).

LCA percolated through the '60s, but erupted for real during the energy crisis of the early '70s. Governments suddenly wanted the biggest bang for their buck, and that meant they had to figure out the economic and environmental impacts of various energy sources and manufacturing processes. The federal government performed "fuel cycle" analyses on such industries as steel, oil refining, and paper. As environmental awareness flared in the '80s, air, water, and land pollution was factored into these analyses.

The "privatization" of LCA began back in 1969, when Coca Cola commissioned a study of various soft-drink

## SEALS TO WATCH

**Germany:** The Blue Angel has been flapping since 1978. As of this Spring, it appeared on 3,200 products in 64 categories, although more than half cluster in four categories (varnishes and coatings, gas burners, recycled paper, and wastewater-treatment agents).

To set standards, the Federal Environment Agency first reviews the lifecycle of a product category. It then sets criteria for products to meet. Hearing-aid batteries, for example, must be zinc-based, contain little mercury, and be labelled for return to the dealer, among other things.

How's it going?

Defining product categories is a major headache. Before the category was cancelled (because every product rose to the standard), aerosol deodorant without CFCs could get the label, but roll-on deodorant couldn't, because it lay outside the category of "aerosol deodorants." Such a narrowly defined product category rewards manufacturers who improve products to earn the seal. But it doesn't educate consumers that aerosols are less green than roll-on.

**Canada:** Since March, 1990, Environmental Choice has issued about 60 seals in 18 product cat-

egories that emphasize recycling and reduced pollution. The standards, based on a lifecycle analysis, will be continually revised upward, so that no more than 10 to 20 percent of the eligible products in a category qualify. The CEO of a company whose product is accepted must sign a statement that the company is in compliance with environmental regulations.

**Japan:** Thanks to a goal of moving improved products quickly into the hands of shoppers, since early 1989, Japan's quasi-governmental program has awarded 850 labels in 31 categories. The program is based on some simple tenets, like energy

efficiency and minimal environmental impact during manufacture, and thus is free from the time-consuming burden of Lifecycle Analysis.

**European Community:** With the opening of trade among these friends, things are going to get messy. The wrangling is already heated, with some symbol-less countries fearing they'll be trodden in trade, but everyone seems determined to have a Community-wide label.

**The Nordic Council:** (Finland, Iceland, Norway, and Sweden) is working on a "harmonized" label, although Denmark is holding out for a European Community symbol.



**Germany's  
Blue Angel**



**European Community's  
Environmental Label**



**Canada's  
Environmental  
Choice**

An official mark of Environment  
Canada (used with permission)



**Nordic Council's  
White Swan**



**Japan's  
EcoMark**



**"Any analyst worth her salt can make a Lifecycle Analysis produce results favorable to a sponsor."**

— Reid Lifset, of Yale's Project on Solid Waste and the Environment

containers. The study was used internally, to decide which package was most energy efficient. Since then, LCA has become a fairly common tool for locating the strong and weak points in a manufacturing process.

But about two years ago, LCA began starring in PR campaigns, and a new can of worms was officially open. After all, if you're a manufacturer, why risk getting panned by Green Cross or Green Seal, when for \$25,000 to \$100,000 you can buy your own scientific study that will prove once and for all that your product is the greenest?

Let's conduct a little test of the effectiveness of those campaigns: Raise your hand if you've heard the following: "Disposable diapers are better for the environment than cotton ones."

"Plastic grocery bags are as good as paper bags." "Disposable plastic cups are better for the environment than disposable paper ones." If you've heard any of these concepts put forth as a scientific certainty, you're a victim of LCA-abuse (see *Science for Sale*, p. 46).

The problems with using LCA as a marketing tool are hefty. Credibility is one. Reid Lifset, associate director of Yale's Project on Solid Waste and the Environment, puts it like this, "Any analyst worth her salt can make a LCA produce results favorable to a sponsor through judicious choice of modeling assumptions, data, and especially through careful framing of the questions that the study is meant to answer." He's not the only one wondering: Where is the old-fashioned, objective science in this science? Says Environmental Defense Fund scientist Richard Denison, "It really is the case these days that when you look at who sponsored a study, you don't even have to open the study to find out what the conclusion was."

Another glitch is that science doesn't travel well in one-sentence sound bites.

An LCA

may find that disposable diapers churn out toxic hydrocarbon pollution and flatten forests, and that cotton diapers are pesticide-intensive and need coal-powered-heated water — completely incomparable environmental impacts. But a PR department may boil down 75 pages of charts and data to a sentence that reads, "Disposable diapers use less energy."

Franklin Associates, which do most of these studies, offer as proof of their integrity the fact that most of their reports aren't made public because of unflattering results that clients don't want publicized. Nonetheless, criticism is rampant. You don't need a PhD to feel twinges of suspicion reading a Franklin report, but the scientists at Environmental Action have been moved to write a critique of two Franklin studies that compare paper and plastic products. The critique, called "Science or PR?," made these points: The studies didn't say who provided the data. They didn't spell out the studies' methodology. They use the term "environmental impact" to mean only the *weight* of pollutants and solid waste — not their environmental toxicity. And, although every new burger box is made with virgin plastic, the burger-box study credits plastic boxes with lessened pollution when the boxes are recycled into rulers and lunch trays.

#### SETAC CALLS A TRUCE

**W**orried that LCA was headed straight for the gutter (since March 1990, three diaper LCAs have been commissioned in this country alone, each with different results), last August the Society of Environmental Toxicology and Chemistry (SETAC) called a conference. The goal was to see if everyone in the field — scientists from numerous nations, research firms, and federal agencies — could agree on a set of rules for conducting an LCA, and a code of ethics for its use. They discovered this would take years, not a week. But they did agree that there should be three parts to an LCA:

**Inventory:** The inventory is the skeleton of the study. If you're studying diapers, you need first to decide how far down the line you'll follow them. You might draw the boundaries for your inventory to include the manufacture, distribution, and use and disposal of the diapers and their packaging, for



instance. Or you might go further, and consider the production of the raw materials like cotton, paper, plastic, and so on. Conceivably, you could include the production of the suede gloves Larry Lumberjack wears when he's cutting wood for Pampers pulp.

You need also to decide whether to consider such things as oil spills, erosion, loss of habitat and biodiversity, groundwater contamination from pesticides, generation of global-warming gases, and a host of other considerations that are well-nigh impossible to quantify.

Once you've decided what you will and won't count (this is where a wily number cruncher can give her client an advantage), you do a mass balance: You measure what's going into the system — renewable and nonrenewable raw materials, energy, process water, and so on. Then you measure the outputs — the product in question, the air, water, and ground pollutants, and solid waste — at every stage from extraction of raw materials through transport, manufacturing, and disposal. You end up with a set of numbers like this: For each 1,000 changes, disposable diapers generate 9 pounds of Pollutant X, 4 pounds of Pollutant Y, and use 4 million Btu of energy; cloth diapers generate 7 pounds of Pollutant A, 8 pounds of Pollutant B, and 3 million Btu.

For now, this is as far as LCA goes. It tells you which diapering system uses fewer resources or more energy, but it doesn't assess the relative danger of the pollutants, and there is no agreement on where the boundaries for a system should be set.

To clarify the boundaries, EPA has contracted the Ohio research institute, Battelle, to write a "guidance document" for life-cycle inventory. The idea is to prevent scientists from unfairly choosing data and boundaries that favor their clients, because, as Bruce Vigon, senior researcher at Battelle puts it, "The problem is not with lifecycle assessment as a tool, but with the use of that tool."

**Impact:** As many critics of Franklin Associates' work have pointed out, an LCA that doesn't weigh pollutants for their relative destructiveness is pretty useless. But who's to decide which is worse: a pound of dioxin in the water, or a pound of benzene in the air — or, for that matter, one acre less of spotted-owl habitat?

Well, there are some tools we can

use. For example, the Occupational Safety and Health Administration (OSHA) administers what amounts to a rating system for toxic chemicals, because it limits the concentration of substances in workplace air — benzene is 1 ppm, chlorine gas is 0.5. EPA keeps numerous, separate lists of substances that cause cancer, reproductive problems, environmental problems, and so on. EPA also has a priority list of environmental threats, topped with loss of habitat and biodiversity, and climate change, then working down through pesticides, surface-water pollution, acid rain, and so on.

From this jumble of information, Tellus Institute, a Boston-based non-profit research group, is putting together a piece of the impact puzzle. In 1989, with the polystyrene-vs.-paper challenge heating up, the New Jersey Department of Environmental Protection hired Tellus Institute to analyze the cradle-to-grave impacts of dozens of packaging systems. Finding scanty data on the eco-toxicity of pollutants, Tellus limited its assessment to human-health impacts. In the report, delivered this summer, Tellus attaches health costs, in dollars, to various food, drink, and hardware packages.

That sounds like an amazing accomplishment, but even its new owners are cautious. "We hope it's beginning to answer how to approach an impact study," says Athena Sarafides, the New Jersey staffer who works with Tellus. This winter, the EPA hopes to host a follow-up to the SETAC conference, dedicated entirely to the impact question.

**Improvement:** It's well and good to know that one diaper's impact is lighter than another's, but the point of this whole exercise is — remember this? — to live with the least impact possible. Even the "winner" is bound to be wasting some resources and creating some pollution. By completing the inventory and impact studies, analysts will get a chance to look closely at where and how pollutants could be reduced.

The Three I's, as they're called, are gaining momentum, but there is foot-dragging. While Franklin Associates did participate at SETAC, Franklin researcher Bob Hunt reports he doesn't anticipate any changes in LCA. "Why should there be?" he

## "The problem is not with Lifecycle Assessment as a tool, but with the use of that tool."

— Bruce Vigon, researcher at Battelle

says. "Things are getting on very well." People who want to add things like peer review and a standardized methodology are just newcomers who don't appreciate the 20-year-old Franklin method, he says.

### WHITHER COMMON SENSE?

In simpler times, finding the perfect packaging system for milk was a matter of rinsing a bucket for the kids to carry to Mrs. Guernsey's farm. We still seem to harbor a kind of instinct related to those times, such as: Paper is more natural than plastic. Reusable is more thrifty than disposable. However, can we trust such instincts, or has our convoluted economic system rendered common sense obsolete?

"Common sense will give you an answer if you've got a little bit of the most important data," says Green Seal's Denis Hayes. For instance, since we know making virgin paper requires tree cutting, heavy pulping, and chemical bleaching; and making recycled paper needs less pulping and bleaching; common sense says recycled paper is greener. And since both paper and plastic bags pollute, a reusable shopping bag makes sense. But as the questions become more complex, like "What does this carburetor cleaner do after I dump it down the drain?" and "How do incandescent and fluorescent bulbs compare?" Green Seal and Green Cross are hoping we'll trust them to choose the trade-offs for us.

Knowing that there is an environment-minded populace looking for salvation, manufacturers will continue to stumble after each other in the search of that holy green grail.



# Theatre of the McServed

Environmental appeasement has center stage in the burger-wars drama.

**B**ehind McDonald's switch from plastic to paper lies a plot reminiscent of a long bedroom farce. Relationships shift with dizzying speed; characters' interpretations of the same events vary vividly; children (while remaining mostly offstage) are pivotal to the dramatic tension; and nearly every character feels, at one time or another, that he was deeply betrayed. At the center of the drama, as with many farces, is a heretofore all-powerful patriarch who, for the first time in his life, notices that his virility might be dissipating. His struggles — to understand that loss, to ward off the blud-

geons of fate and yet hold true to the roots of his power — give the drama its tragicomic spirit. In this case, however, the faltering patriarch is not a person, but a corporation.

No ordinary corporation could play the role. It requires McDonald's unique cultural cachet — as a symbol (even a cliché) for America and Americans. In such exotic outposts as France, Holland, and San Francisco's Haight-Ashbury, McDonald's restaurants serve as embassies from mainstream America, with concomitant squareness and civility. It's significant that *perestroika* arrived around the same time that McDonald's bought land for its first restaurant in Moscow, after 14 years of trying to get in.

Most of the worldwide chain's 12,000 restaurants, of course, are located in the miracle-mile bazaars of American suburbia, where golden



PHOTOS COURTESY OF MCDONALD'S

BY ART KLEINER

*In 1976, the company commissioned Stanford Research Institute, a think tank with the reputation for translating New Age ideas in a way that even executives could appreciate, to research environmental measures*

arches became the de facto inspiration for the visual ambience of the road. With this intimate presence, even McDonald's executives admit that the company belongs to American people in some psychic (albeit non-financial) way; because of its scale and influence, we all have a stake, whether we eat hamburgers or not, in what McDonald's does. (Indeed, the most consistently cogent commentator on the firm is the magazine *Vegetarian Times*.) Thus, when McDonald's abruptly moved from polystyrene clamshells to paper hamburger wrappers last fall (along with 40 more subtle changes), that decision belonged to all of us, open to our scrutiny just as much as a government decision should be.

McDonald's and its partner, the Environmental Defense Fund, have taken an "aw shucks, we're just getting our own house in order" public stance; and other actors (notably the plastics industry) have said it won't affect them much. Nonetheless, the ramifications clearly will ripple out far beyond the golden arches. The advocacy power of citizen's groups (like the Citizen's Clearinghouse for Hazardous Wastes) has been given a dramatic boost; no target is so large it can ignore insistent grass-roots lobbying, especially if it involves school groups. Plastics recycling has been chastened; the industry's grandiose promises are being toned down to smaller, more definable goals. The practitioners of "lifecycle analysis," an academic technique for comparing the cost and effects of particular products, will be ever more visible; you'll see the fruits of such analyses in news stories to come. Joint projects like the one between McDonald's and the EDF

will flourish, some with and some without the safeguards on which the EDF insisted. The only thing that won't change is advertising; we won't see "holier-than-thou" commercials between the fast-food rivals. We won't need them. As in any bedroom farce, the virtue of the principal players has come under the harsh stagelights of public display, and nothing will ever be the same.

To begin the drama, we might go back to the mid-1970s, when McDonald's was at its peak — the first, biggest, and only independently owned major fast-food chain. (Heublein owned Kentucky Fried Chicken, Pepsi owned Taco Bell, and Pillsbury owned Burger King.) McDonald's uniformity on the outside (in which every beef patty weighed exactly 1.6 ounces worldwide) was matched by its success-bred arrogance on the inside. Every prospective franchise owner, for instance, agreed to give up other entrepreneurial interests, operate the business full-time, relocate where stores were available (which might be hundreds of miles away), and attend the famous "Hamburger University" for two years — full-time. There were also strict rules about investment capital, and McDonald's owned the land under the restaurants. Nonetheless, being a franchise owner is profitable enough that McDonald's still gets 20,000 applicants per year, of which they accept 200.

Culturally, the corporate office

was unremittably mainstream, probably much more so than their customers in the 1970s. A then-franchise owner named Mirick Friend recalls a national meeting in which he suggested that the company offer salads and other less salt-laden foods. "Lettuce is

for flower children," replied the McDonald's executive who had the floor, a fast-tracking, charismatic, somewhat brash man named Edward Rensi. (He's now company president.)

Nonetheless, Rensi and his peers were concerned about environmentalism. In 1976, the company commissioned Stanford Research Institute, a think tank with the reputation for translating wild-eyed New-Age ideas in a way that even executives could appreciate them, to research environmental measures. FDA regulations about food contamination ruled out using recycled paper to wrap Big Macs. But polystyrene clamshells would save trees, save manufacturing costs, save energy, and use up byproducts of oil refining. Moreover, "garbage-to-energy" incineration was in vogue, and polystyrene was valued in the incinerator; it burned hot, helped break down complex molecules in other garbage, and produced, per pound at least, more heat and thus more energy. And it led to the invention of the much-ballyhooed McDLT, where polystyrene (a cousin of "styrofoam" insulation) separates the hot meat from the cold lettuce.

But the huge investment in adopting polystyrene for so many restaurants meant an ideological commitment to it — and that commitment had to weather an increasing number of storms. When the effect of CFCs on the ozone layer was reported, those chemicals had to be phased out of polystyrene manufacture, and replaced with HCFCs (hailed as harm-

**Mainstream USA: The first McDonald's, featuring the mascot "Speedee," in Des Plaines, Illinois.**



less, now seen as only marginally safer). Landfill crunches, unforeseen in the 1970s, began prompting local bans on polystyrene around 1987. The fact that plastic litter stays around longer than paper no doubt prompted much of the reaction; people saw the slug- and mustard-colored clamshells bobbing in streams and ditches. McDonald's responded by prototyping two "Archie McPuff" incinerators, meant for behind the restaurants — an idea immediately unpopular with citizens' groups — and by joining the plastics industry's hastily assembled polystyrene-recycling efforts. McDonald's sought advice from environmental groups like the Environmental Action Coalition in New York, an astute recycling-oriented organization (whose book *Plastics: America's Packaging Dilemma* was published this year by Island Press).

By mid-1990, McDonald's was the most visible player in the polystyrene-recycling movement, making a heroic effort led by a senior corporate vice president named Shelby Yastrow.

They had about 600 bins installed in restaurants (mostly in New England and New Jersey) where people could drop off the clamshells and polystyrene cups; the containers were trucked to central warehouses (one west of Boston, another in the Greenpoint section of Brooklyn), shredded, and offered to plastic-durables companies like Rubbermaid. In part because McDonald's customers couldn't be counted on to do all the separation right (paper wrappers made their way into the plastics bins), the quality of the plastic was poor; Rubbermaid complained to the *New York Times* about it. And the costs of shipping all that puffy, lightweight crystallized plastic, plus the fact that at least half the polystyrene left McDonald's restaurants in take-out bags, made many people skeptical that recycling could ever work.

The result was, perhaps, inevitable. Again, McDonald's the icon became a symbol — this time for unbridled trash. Starting in Vermont, then spreading to New Jersey, and ulti-

mately throughout the nation, the McDonald's boycott campaign of 1989 and 1990 erupted. The Citizen's Clearinghouse for Hazardous Wastes, which coordinated and promoted the campaign, had discovered an organizing gold mine, much better than a mere national march that the media would label the work of eco-extremists. Their "Ronald McToxic" caricature was, in effect, an anti-brand name. Each local group used it a different way — battling landfills or incinerators by holding up a clamshell and saying, "See? This is what we're burying or burning — and we don't yet know what toxics it may release."

**T**erri Capatosto, the McDonald's vice president of public relations, says the McToxic campaign had little influence on the company's decision; they were considering change as early as 1987. Even the new paper-and-polyethylene wrappers had been developed by 1989 by a paper supplier (for use by Taco Bell, ac-



*The campaign affected McDonald's people emotionally. They felt especially betrayed by schoolchildren, who took up the McToxic cause, dressing up as clowns and sending back their grimy, gloppy used clamshells.*

cording to an industry veteran, and apparently unbeknownst to McDonald's). Nonetheless, there's little doubt that the campaign affected McDonald's people emotionally, particularly the franchise holders. They felt especially betrayed by schoolchildren, who took up the McToxic cause, dressing up as clowns in floppy shoes and cotton-candy hair, and sending back their grimy, gloppy used clamshells to Shelby Yastrow's office. McDonald's executives say, disingenuously, that those protests were sparse and staged for *Time* magazine. But they got the message; the company itself had underwritten a World Wildlife Fund booklet for schools, called *Wecology*, which told kids to write directly to companies whose practices bothered them. Moreover, McDonald's was also under siege from anti-cholesterol crusaders using similar public-sympathy tactics. The company began looking for ways to make significant change without giving the impression that they would give in easily to any special-interest group that came along.

As it happened, the Environmental Defense Fund approached them, late in 1989, seeing an opportunity to influence the whole industry. EDF had been formed in the late 1960s by a group of aggressive Long Island lawyers and scientists, battling DDT spraying under the motto "Sue the bastards!" They gradually softened their stance, but continued to focus on legal cases where they had done massive technical homework. The deal they hammered out with McDonald's was unique in both environmental and corporate history: They would form a joint task force. EDF would become, in effect, unpaid advisors, with near-complete access to the company's data. They'd work in the restaurants, talk to suppliers, and generally inves-

tigate every aspect of the business. Then the task force would submit a plan; McDonald's would choose what aspects to adopt, but EDF could publish their own report for McDonald's competitors to learn from.

It was, in fact, an enlightened way to operate. And it produced, ultimately, an enlightened set of proposals: Phasing out bleached paper. Reusing shipping palettes. Testing reusable cups, shipping containers, and coffee filters. Recycling polyethylene shrink-wrap. Composting eggshells and coffee grounds. Buying recycled materials (including plastic-lumber tables and chairs). Perhaps most enlightened was the idea that no solution would be permanent; McDonald's (with or without EDF) would continue to experiment, pushing packaging suppliers to develop lower-waste materials, developing pilot projects and then rolling them out at all 12,000 stores — in short, becoming as resilient with its waste as it was at introducing new foods.

In that context, the switch to a non-recyclable paper wrap (because it is laminated to polyethylene) was never seen as final. The immediate rationale for the switch was based on the hierarchy of waste-management practice, which says that reducing the amount of material used is better than recycling a substitute, because of the extra effort, energy, cost, and current inefficiencies of the recycling process. As the task force made its case, protests erupted within the company. The plastics advocates (like Yastrow) had worked with their peers (at Dow and Mobil, for example) for two years; they were just about to announce a roll-out of the polystyrene recycling

program to all 8,500 American restaurants. This task force was a comparative upstart. Meanwhile, CCHW members flooded the EDF and McDonald's with anti-plastic phone calls.

After three days of wrangling, a decision was made. McDonald's plastics-recycling partners were informed a few hours before the *New*

*York Times* reported it. That article included a statement from company president Edward Rensi: The plastic-clamshell packaging was environmentally sound, he said, "but our customers don't feel good about it, so we're changing." The plastics people had their turn to feel betrayed. Unaware of the task force's technical rationale, they thought McDonald's was sacrificing their project in favor of public-relations hype.

**N**ow the farce kicked into high gear. It says something about the haphazard priorities of corporate environmentalism that only one recent lifecycle analysis of paper versus plastic fast-food containers existed at that time. It had been compiled by a small mom-and-pop consulting firm called Franklin Associates, located near Kansas City, who were to lifecycle analysis what Doc was to medicine in *Gunsmoke*: the only game in town. Hired by a plastics-industry association group called the Council for Solid Waste Solutions, they had compared the ecological effects of polyethylene-coated paperboard — the kind used in a Burger King box — to polystyrene clamshells. They tried, as Franklin told me, to "stay away from a win/lose analogy," but their tally sheet nevertheless favored polystyrene over paperboard. It cost 30 percent less energy to make, and its manufacture released at least 40 percent fewer effluents into air and water. A Canadian chemistry professor named Martin Hocking, in a much-quoted article in *Science* magazine in February, made similar points about

**Gilded Arches: The 10,000th McDonald's, born in Dale City, Virginia, on April 6, 1988.**



plastic coffee cups.

Thus, in late 1990 and all this year, ads (from plastics recyclers) and articles have appeared citing those studies. One of the most strident appeared in *Forbes*, a magazine that often tweaks environmentalists: It implied that McDonald's was blackmailed by the Citizen's Clearinghouse and hoodwinked by the EDF into a decision without technical support. Unfortunately, however, the pro-plastics counter-charges depend on a misinterpretation of the Franklin study: It never compared the two McDonald's wrappers, but only a choice that McDonald's never made — the stiff cardboard box. Franklin themselves said later that the paper wrap was the best of the lot (ecologically speaking) — and plain butcher paper would be better still. At this writing, few people know which side to believe.

The EDF people, who say coyly that they never anticipated the public scrutiny, suddenly had their turn to feel be-

**New Age: A contemporary McDonald's, designed to blend with its host city, Los Angeles.**

*The most important player may be us: a hundred-million-member Greek chorus, hardly monolithic, yet passing judgement everyday. Their perception of our moodiness has forced McDonald's to become ever more resilient.*

trayed. They never did manage to get the idea across that the new paper wrap would take up less room in landfills. Why, people asked, should it be going into landfills in the first place? It didn't help that, as director Nancy Wolf of the Environmental Action Coalition points out, the paper wrap they chose is not only laminated to polyethylene, but also bleached with chlorine.

In the turmoil, the most important point made by Franklin and Dr. Hocking, the lifecycle analyzers, was somehow lost: that you can't generalize these choices from cups to boxes to wrappers. Every container decision is different; the impact varies, for instance, depending on how far supplies must be trucked in, and how far recyclable materials must be trucked away. As lifecycle analysis becomes a more exact science, we may find a McDonald's in

Peoria using plastic, while its counterpart in Patchogue opts for paper.

Like most farces, this one may end more-or-less happily. Plastics manufacturers are now focussing on institutions that still use polystyrene — most schools, hospitals, and workplaces, at least until they all get around to franchising their cafeterias to McDonald's.

McDonald's, meanwhile, is looking into composting its paper wrap — and coping with customers who complain that the sandwiches are cold.

One thing everyone agrees upon: What McDonald's does will be enormously influential, if only because it will press its paper suppliers to offer new wraps. Those paper companies have salespeople who won't shrink from saying to their other customers, "Didn't you read what McDonald's is doing?"

In general, marketing savants throughout American industry are trying to come to terms with consumers these days. Advertising seems not to work as well; consumers seem better educated than they ever have been. Still, education only goes so far; fast-food people still talk about the blazing defeat of Dee-Lite's, a fast-food chain

that pitched nutritional value. In the drama of McDonald's, then, the most important player may be us: a hundred-million-member Greek chorus, hardly monolithic, yet passing judgment every day. Their perception of our moodiness has forced McDonald's executives to become ever more resilient, even to the point of embracing environmentalism. Indeed, the environment-sensitive consumer may lose every concrete, tangible reason to despise McDonald's.

Only the fact of its existence will be left, and its cumulative effect on American cuisine, architecture, and culture as restaurants fan out across miracle miles, compelling and yet somehow awful in their numbers: thirty billion served.



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Percentage of methane among  
all greenhouse gases:

**15**

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	millions of metric tons produced yearly	percentage of total methane emissions
Wetlands .....	<b>115</b>	<b>20.2</b>
Rice fields .....	<b>110</b>	<b>19.4</b>
Cud-chewing animals* .....	<b>80</b>	<b>14.0</b>
biomass* (burning of forests) .....	<b>55</b>	<b>9.7</b>
oil/natural-gas pipeline leaks* .....	<b>45</b>	<b>7.9</b>
termites .....	<b>40</b>	<b>7.0</b>
coal mining .....	<b>35</b>	<b>6.2</b>
landfills* .....	<b>35</b>	<b>6.2</b>
animal waste* .....	<b>28</b>	<b>5.0</b>
sewage* .....	<b>25</b>	<b>4.4</b>

\*human-influenced activity

Source: EPA, GARBAGE staff



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Source: South Coast Air Quality Mgt. District  
Note: Above figures do not include emissions  
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El Segundo, Calif., storage tanks:..... **200 MILLION GALLONS**

Number of commercial  
storage tanks in the U.S.:..... **2 MILLION**

Number of leaking  
commercial tanks in the U.S.:..... **300,000 to 500,000**

Source: Rachel's Hazardous Waste News, EPA

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EPA work force in 1970:  
**5,500**

EPA budget in 1970:  
**\$1.3 billion**

Major statute administered:  
**Clean Air Act**

EPA work force in 1990:  
**17,170**

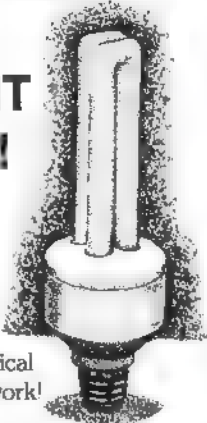
EPA budget in 1990:  
**\$5.14 billion**

Major statutes administered:

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Safe Drinking Water Act; Toxic Substances  
Control Act; Resource Conservation & Recovery Act;  
Quiet Communities Act; Superfund Act;  
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Asbestos Hazard Emergency Response Act;  
Superfund Reauthorization Act; Safe Drinking Water  
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Source: EPA, Wall Street Journal

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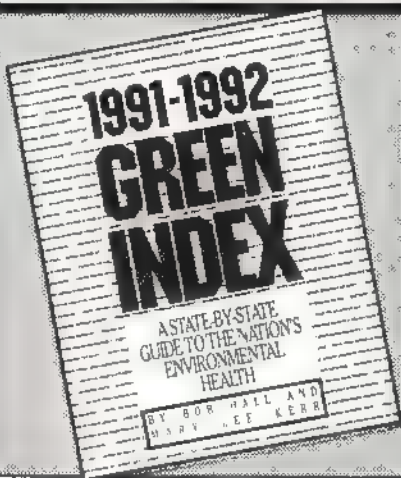
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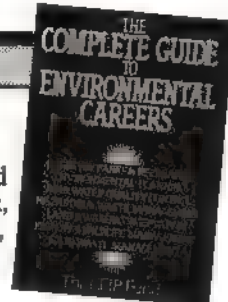


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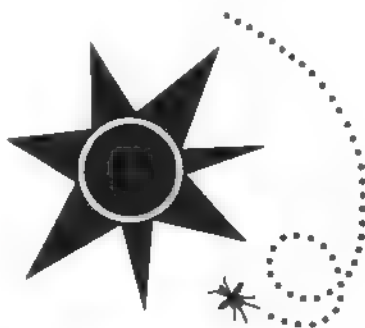
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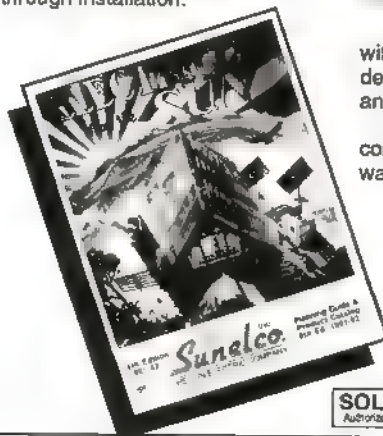
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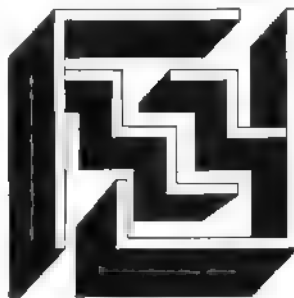
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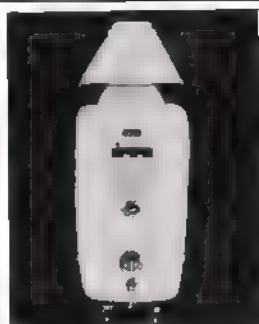


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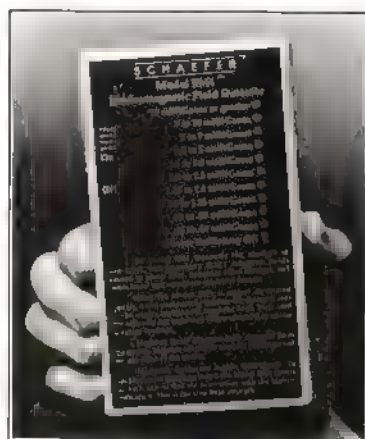


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### PRODUCTS

**H**ugo's Own Potting Soil  
The yapping about how composting can solve our solid-waste problems has been accompanied by whispers of concern: Who's gonna buy 160 million tons of compost each year?

Well, for a few tons, the answer is home gardeners. The Womack Nursery Company in South Carolina is selling a potting soil made from lawn waste and wood fiber.

Hurricane Hugo left Charlotte, North Carolina, and Columbia, South Carolina, with mountains of leaves, branches, and bark.

Along with grass clippings and

soil, these mountains are gradually being converted into rows of compost. Simultaneously, local lumber mills have been hauling their wood-fiber waste to the landfill—it's no longer legal to burn it in the open.

Womack put one and one together. The wood fiber performs like peat moss, providing water and air retention; no one needs to devastate peat bogs. The composted yard waste provides plant nutrients. The resulting potting soil, called Nature Plus, is available through Wal-Mart stores and some smaller lawn and garden centers. For a retailer near you, contact Womack at P.O. Drawer 1306, Dept. GM, Lake City, SC 29560; (803) 394-7473. An 8-quart bag retails for about \$2.

### Green Guessing Game

We've seen some environmental games that beg for a home in the dumpster, but Earthword is a well-designed attempt to educate and entertain (in that order). The concept is like a hybrid of Trivial Pursuit and Bingo.

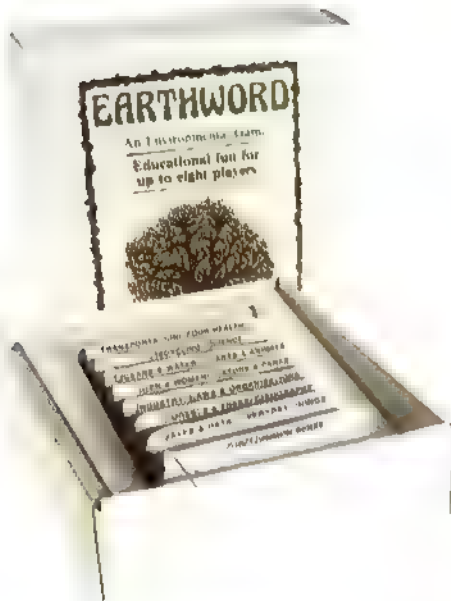
There are two components: game cards listing an "earthword," and question cards. To start, players are dealt a game card listing a word such as "green party," "conservation," or "solar energy." The object is to cross off each letter of the earthword by correctly answering questions from corresponding question cards: If you need a "G" for your "green party" game card, you choose a question card from the "Geography" category. To get your "R," choose a "Recycling" question card. The earthwords are balanced with free letters; no matter the length of the word, you need acquire only 10 letters per card.

There are 800 questions on 400 cards. These are divided among 16 categories, including Air, Dates and Data, Forests and Trees, Laws and Organizations,

**A high-fiber diet for the garden, courtesy of Hurricane Hugo.**



PHOTOS BY HORIZON



**Think you're a savvy enviro?  
Test your smarts with Earthword.**

and Recycling. The questions cover a wide range, from very obscure to very obvious. They will be most challenging to an environmental neophyte with a reasonable vocabulary. Under the Air category you'll find questions like:

"Nitrous oxides contribute to the greenhouse affect. True or False?"

"Trees steal oxygen from people and mammals. True or False?"

Under the Transportation category, you might see "The total number of gas stations in the United States is: a. 59,000, b. 109,000, c. 159,000."

To order, send \$23.95 to Earthword, Inc., 104 Church St., Dept. GM, Keyport, NJ 07735; (908) 264-3012.

**Hand-Saving Bag Handles**

Yeah, they're a little silly, but be honest: Since you bought half a dozen string bags last year, how many times have you left them at home? Would that have anything to do with the way they crush your fingers when you're carrying a half-gallon of milk?

By adding a big grip to little handles, these Handi-Grips may add new life to your good intentions. The Handi-Grip is shaped like a plastic taco. The handles of your bags (or paint cans or heavy buckets) are the filling of the taco, and a little clip keeps them in. The bottom of the taco is gently grooved

to make for an easy grip.

So far, the only way to get your hands on some is through the mail-order company Seventh Generation. (Unfortunately, the minimum shipping charge is twice the cost of the grips — so order a bat house and some fluorescent light bulbs to make it worthwhile.) Seventh Generation sells the recycled-plastic version. Two for \$1.95 plus \$3.75 shipping from Seventh Generation, Dept. GM, Colchester, VT 05446-1672; (800) 456-1177. Catalog \$2. For an update on availability, call Swenco at (519) 884-7400.

**RESOURCES**

**Killing Roads: A Citizen's  
Primer on the Effects & Removal  
of Roads**

by the Earth First! Journal, P.O. Box 5871, Tucson, AZ 85703. Brochure, free.

Wilderness, and how we experience it, is an explosive issue. Some folks think you should enter it as just another member of the animal order — on foot, in silence, and leaving little sign of your wanderings. Other folks think it's fine to come in screaming, gears grinding — enjoying the exhilaration brought on by the big outdoors.

Rules in our National Forests are designed to prevent these two types from crossing paths. But the National Forest Service's lax enforcement means that once a timber stand is clearcut, countless logging roads illegally remain. This irks wilderness purists like members of Earth First!. It also causes severe erosion and pollution problems, and stresses wildlife. Large species, like bears and wolves, will vacate an area crisscrossed by too many roads.

Besides providing a guide to legally forcing the closure of these illegal logging roads, *Killing Roads* gives a good introduction to what's wrong with all roads: They isolate small groups of animals, thus shrinking the gene pool. They create roadkill. They allow vehicles to introduce heavy metals, pesticides, salts, and hydrocarbons. They allow the intrusion of exotic plants and animals that may beat

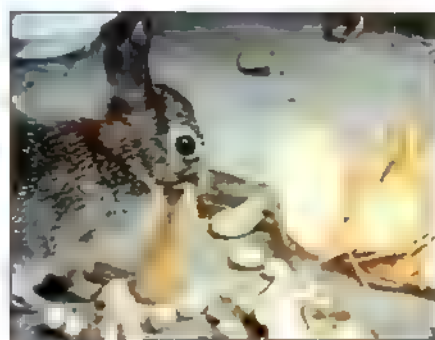
**Handi-Grips help  
tote the groceries,  
without pinching.**







**Backyard Safari:** Marilyn Schenk tracks suburbia's birds, bees, and rabbits.



out the natives. They instigate erosion, drainage, and water-table problems. What's worse, they bring — here's the Earth First! we know and love — "cretins" with their "chain saws, ATVs, guns, dogs, and ghetto-blasters" to what was wilderness.

Nevertheless, *Killing Roads* doesn't ask readers to shut down Interstate 10. By following this how-to manual's instructions, you can reconstruct the paper trail that may force the NFS to "rip" a road that is supposed to be closed, and revegetate it. For do-it-yourselfers, *Earth First!* provides some hints, illustrating various methods of earth-moving, and listing recommendations of the Interagency Grizzly Bear Compendium.

If you succeed in closing a road, think twice before you lace up your "waffle stompers" to go and enjoy the silence. From an *Earth First!* perspective, a "wilderness trail" is an oxymoron.

### **Backyard Safari**

Video by Jack Schmidling Productions, 4501 Moody, Chicago, IL 60630. \$32.

This video documents a backyard restoration project that includes a tiny prairie, a pond, and wildlife-oriented plantings. If Mia Amato's "Backyard Restoration" (March/April '91) made you want to trade in your turf grass for something more interesting, here's how.

The production is a bit amateurish, and the narration is comically low key. Producer/photographer/narrator Jack Schmidling sounds like he stayed up all night filming nocturnal bugs. But as the footage illustrates the step-by-step transformation of the mid-sized backyard, you'll find plenty of helpful information buried under that Midwest monotone. Besides the pond and the prairie, much attention is paid to the particular likes and dislikes of prospective tenants, from hydra and leopard frogs to goldfinches, crows, and rabbits.

The labor (Jack's cheerful wife Marilyn appears to do most of it) is interspersed with fun shots of nature in action. The sincerity behind the hard-won pictures will make you feel involved in a way a slick National Geographic special never could. After seeing the work needed to attract nature to the suburbs, you watch as bold, new urbanites flutter, crawl, and hop into the new habitat. Some high points: the life cycle of a monarch butterfly, squabbling mice, and time-lapse photography of self-destructing mushrooms.

### **Business Recycling Manual**

by INFORM. 196 pages. 381 Park Ave. South, New York, NY 10016; (212) 689-4040. Looseleaf binder, \$90 ppd. (Some discounts available; ask for Jerri McDermott.)

Too often, some poor sap expressing his environmental sensitivity to the boss is the one condemned to reinvent the wheel: deciding what's recyclable, how to collect it, how to force co-workers to participate — only to discover that his contribution to environmental salvation is too puny to interest any buyers.

This manual is a step-by-step resource for a company of any size which wants to take the novel approach of starting at the beginning and emerging at the end with a workable, affordable recycling program.

The workbook leads with a message to the boss, outlining the problems she'll face, what to consider when choosing a recycling coordinator, and what kind of support that person will need. From then on, it's practically a matter of filling in the blanks.

The manual includes charts to complete for every section of a business that generates garbage: what kind, how much, where it can be stored, and so on. There are charts to identify recycling goals, and to locate local waste haulers and learn the specifics of their contracts. For the exec who's never ventured into the basement, there are drawings of



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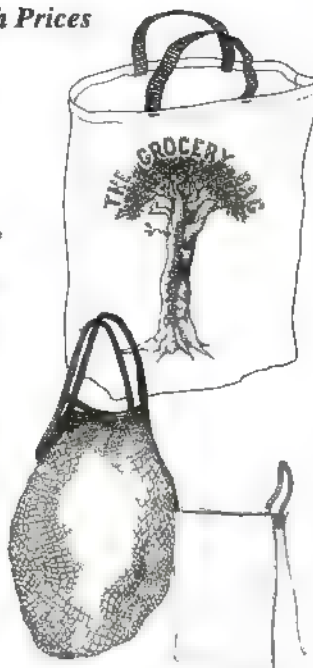
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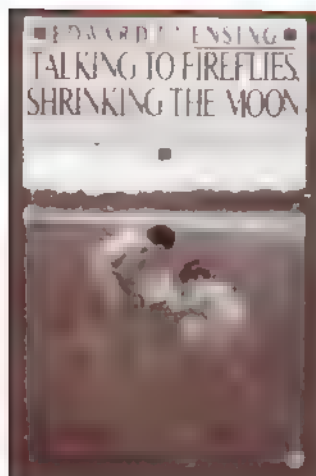
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basic garbage and recycling equipment. Appendices provide book lists, periodicals, studies, jargon, market sources, and an equipment directory. Nothing is overlooked. There are even pre-written conversations to help the neophyte handle wily waste handlers: "Hello. Is this \_\_\_? I am \_\_\_. I am calling to discuss the types of services..."

#### 1991 Paper Recycling Markets

438 pages. GIE Publishing, 4012 Bridge Ave., Cleveland, OH 44113. Softcover, \$27.50 ppd

Not a bad companion to the above manual, this guide lists more paper-recycling contacts than anyone living anywhere in the country would ever need. That includes 2,400 paper dealers, 530 mills, plus state- and local-government listings, and equipment and service vendors.

#### Talking to Fireflies, Shrinking the Moon: A Parent's Guide to Nature Activities

by Edward Duensing. 177 pages. Penguin USA, Cash Sales, P.O. Box 999, Bergenfield, NJ 07621; (800) 331-4624. Softcover, \$10.45 ppd.

Body surfing, fiddling for worms, hypnotizing frogs ... this handbook is crammed with ways to educate and entertain yourself and your children outdoors. Although the author is partial to weaving fairy tales around nature's weirder phenomena, you'll also get the hard explanations kids can be counted on to demand.

What kids and adults stand to gain from this book is a better relationship with elements of the natural world, from stars to weather, plants, and especially animals. Even as author Edward Duensing is showing you games to play with bugs you once thought could paralyze you with the wave of a feeler, he's gently reminding you that these bugs have rights, and that your play should be gentle and brief.

This is a good guide to take into your backyard, to a vacant lot, or on a camping trip. There are long- and short-term projects for every season. No fancy equipment is needed, just lots of curiosity and the willingness to look under rotten logs.

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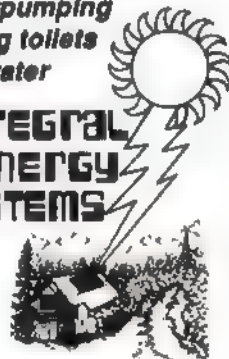
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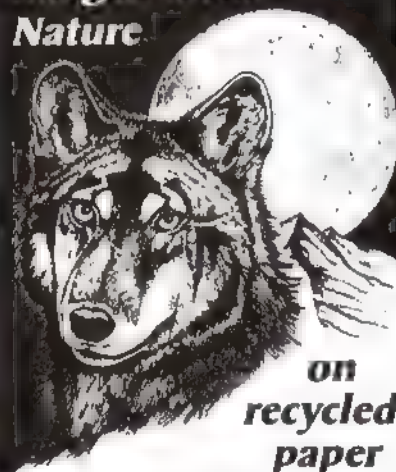
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**Keep smoke detectors out of the haz-waste center; styrene, cream, and sugar; when smoke gets in your burgers.**



ILLUSTRATIONS BY VICKY RABINOWICZ

**Q:** Should I be concerned about the radioactive material in my smoke detector?

— Marcia Steiger  
Fairfax, Calif.

**A:** Probably. "Ionization" smoke detectors contain the isotope americium-241, a by-product of processing plutonium for nuclear weapons. The radioactive material is used to electrically charge (ionize) a small chamber in the detector. Smoke interrupts the charge, tripping the alarm.

Americium-241, which emits alpha radiation, is enclosed in a sealed module. Theoretically, it's safe. But if the seal is less than perfect, or if the smoke detector is damaged — burned in a fire,

smashed in a garbage truck, or pried open by a curious child — toxic americium can be ingested.

While the Nuclear Regulatory Commission and the federal Department of Energy maintain that the amount of americium in a smoke detector is too tiny to worry about, some scientists argue there's no such thing as a harmless dose of radiation. According to Dr. Edward Martell, an environmental radiochemist with the National Center for Atmospheric Research, there are thousands of lethal doses in one microcurie of americium-241. The NRC says the average amount in smoke detectors is two microcuries.

Of course, you've never heard of anybody taking apart their smoke detector and dropping dead an hour later. The damage from alpha radiation can take 20 years to manifest itself — usually in the form of lung cancer.

Say your smoke detector goes on the fritz. How do you get rid of the thing? Open it up and you'll probably see a label telling you to send it back to the manufacturer. We called several. They told us to toss the detectors into the trash. (One fellow said we could take them to hazardous-waste collection centers. Don't try it — they don't accept radioactive stuff.) With millions of smoke detectors eventually headed for landfills, americium could seep into aquifers and work its

way up the food chain. (It's got a half life of 460 years.)

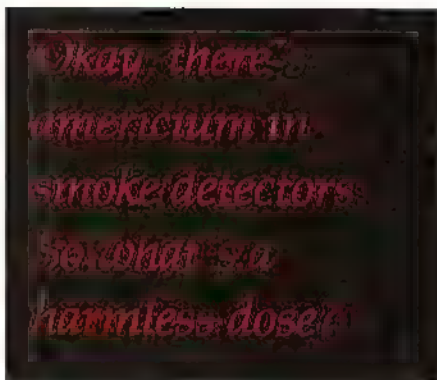
Some good news: Another kind of smoke detector uses a harmless photo-electric cell. Unfortunately, it isn't available at most neighborhood hardware stores. One place you can buy a photo-electric model is Sears (the First Alert SA 202A). The Gentex Corporation of Zeeland, Michigan, also makes them. Call for the name of a local distributor: Gentex Corporation, 10985 Chicago Drive, Dept. GM, Zeeland, MI 49464; (616) 392-7195.

**Q:** When I drink tea from a disposable cup, I've noticed that the lemon "eats" the styrofoam. What's going on here? Does anything leach into the tea?

— Lise Michelman  
New Marlboro, Mass.

**A:** First things first: What most people call styrofoam is actually polystyrene — "STYROFOAM" is a brand name for a kind of foam insulation.

The lemon-tea controversy heated up in 1979, when a doctor told the *New England Journal of Medicine* that lemon-tea drinkers were also ingesting "an appreciable amount of the container itself in solubilized form." The FDA, finding that only miniscule amounts of polystyrene could leach into tea, concluded that it isn't a health threat. Polystyrene manu-







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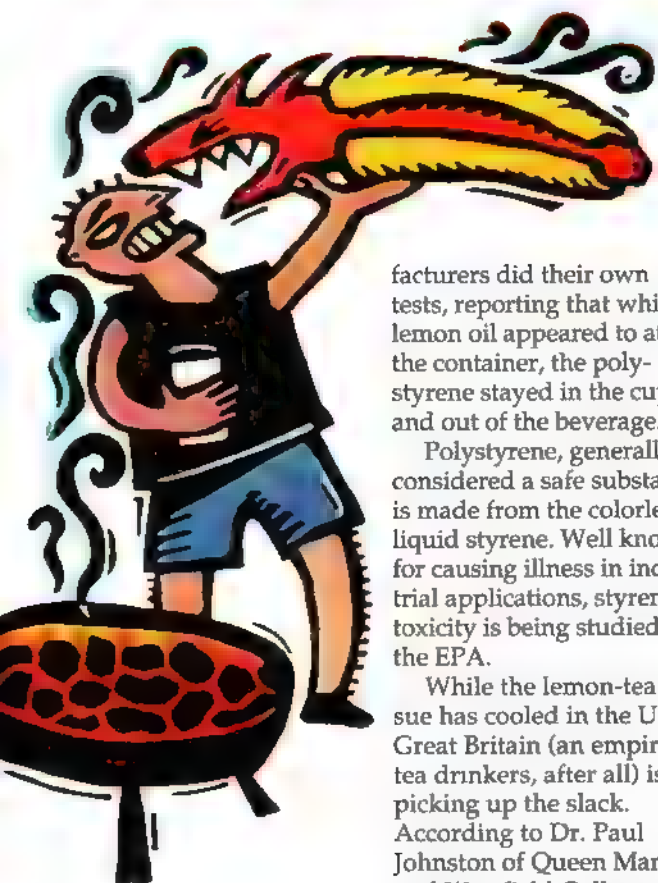
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facturers did their own tests, reporting that while lemon oil appeared to attack the container, the polystyrene stayed in the cup and out of the beverage.

Polystyrene, generally considered a safe substance, is made from the colorless liquid styrene. Well known for causing illness in industrial applications, styrene's toxicity is being studied by the EPA.

While the lemon-tea issue has cooled in the U.S., Great Britain (an empire of tea drinkers, after all) is picking up the slack. According to Dr. Paul Johnston of Queen Mary and Westfield College, any polystyrene cup contains a small amount of styrene which remains untouched by the polymerizing process; this unlinked styrene is free to find its way into a cup of tea. Dr. Johnston thinks he'll detect levels of styrene and additives migrating out of the cup which went undetected ten

years ago. But it'll be a while before anyone draws definite conclusions on the health risks of polystyrene.

EPA adipose-tissue studies have found small amounts of styrene in 100 percent of the people tested. In

other words, there's a little styrene in all of us.

**Q:** What's in the emissions from burning charcoal briquettes? Does any of it get into my hot dogs?

— Rick Goldblum  
Verona, N.J.

**A:** We can thank Henry Ford for the backyard barbecue. The first briquettes were made from charred scrap wood at Ford plants. These natural-wood briquettes, which were used in factories, restaurants, and cruise ships, were popular until the early 1950s — the beginning of the Backyard Barbecue Boom. That's when the modern coal briquette, as worthy an icon of the Eisenhower years as any fin-tailed Cadillac, was born.

Charcoal briquettes combine coal or oil, limestone, borax, sodium nitrate, and sawdust. Burning gives off primarily carbon monoxide, nitrogen oxide, and sulfur dioxide, as well as particulates and some organic compounds (although the amounts are difficult to quantify).

The EPA hasn't studied emissions from charcoal briquettes. But last year it got together with an air-quality consulting firm to test charcoal lighter fluid, which produces volatile organic compounds (VOCs) that help create ozone, a prime component of smog.

To keep your barbecuing relatively smog-free, avoid using lighter fluid. Also avoid "quick-start" charcoal, since it's impregnated with

lighter fluid. Use newspapers or paraffin-based cubes to get the fire going.

Charwood, which is made the old-fashioned way (out of wood, not coal or oil) isn't as polluting as charcoal. One charwood brand, Nature's Own, eliminates chemicals and petroleum from the manufacturing process. (So far, it's available only in Canada and parts of the Northeast: Nature's Own, 5 Central Square, Dept. GM, Stoneham, MA 02180; (617) 438-8984.)

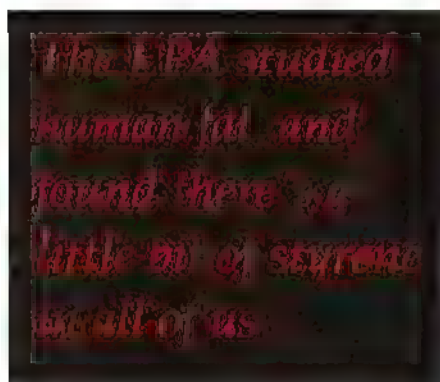
The chief health risk of grilling has nothing to do with what's in the charcoal. According to the July/August '89 *Nutrition Action Health Letter* (published by the Center for Science in the Public Interest, Washington, D.C.), a group of possibly carcinogenic chemicals called PAHs (polycyclic aromatic hydrocarbons) form when dripping fat hits coals or open flame. The resulting smoke carries the PAHs into food. The *Health Letter* recommends a drip pan to keep the fat out of the fire.

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<b>51.</b> \$2.25	<b>97.</b> \$1.90	<b>141.</b> Free	<b>170.</b> \$1.25	<b>195.</b> Free	
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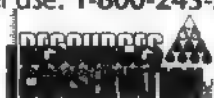
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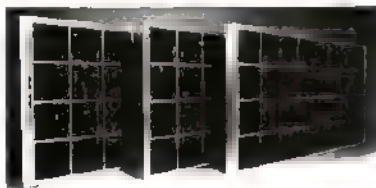
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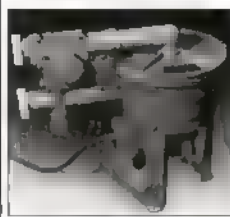
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## THE ENVIRONMENT AND SAFETY TELEVISION NETWORK

The first private business television network dedicated exclusively to environmental and safety issues will begin presenting a series of live and interactive videoconferences. The September 13, 1991 videoconference concerning "The Definition of Hazardous Waste" will be broadcast to 18 major cities in the U.S. For further information call Nick LaVecchia: (214) 983-9983, or Marty Rowland: (504) 283-1711, or write to: Environet, PO Box 29792, New Orleans, LA 70189.

## GREEN-KEEPING

The publication for nontoxic and environmentally-safe alternatives. Edited by Annie Berthold-Bond, author of Clean & Green. Contributors include Debra Lynn Dadd, Donella Meadows, and John Bower. Green-Keeping, Box 28, Annandale-On-Hudson, NY 12504, (914) 246-5243.

## ENVIRONMENTAL TRAINING WORKSHOP CATALOG

The University of Findlay's Environmental Training Workshop catalog, which includes courses that will be held July through December 1991, is now available. The catalog contains course schedules and per-person fee information on various workshops. All workshops will be held at The University of Findlay's Emergency Response Training Center. Training also can be arranged at the client's facility. Group discounts are available. For a free copy of the workshop catalog, or information on training at your facility, contact: J. Randal VanDyne, The University of Findlay, Emergency Response Training Center, 1000 N. Main Street, Findlay, OH 45840, (419) 424-4647.

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## (How *not* to sell a green product)

**M**ost environmental marketers have the savvy to use an environmental publicity campaign: press releases printed on both sides of recycled paper that looks like it's sprinkled with compost. But these...

### CONE HEADS

Ketchum's campaign positioning Joy Cone's IncrediBowl ice-cream cone as the environmental panacea is a classic case of muddled marketing. The sundae-dish-shaped cones arrived (broken) in a plastic-wrapped, heavy-duty cardboard tube that was stuffed with hunks of bubble wrap and sealed with saucer-sized plastic caps. Deep in the tube were a photograph, a two-page history of ice cream, a plastic binder of press releases printed single-side on virgin paper, and a poster promising "the Joy of a clean environment."

### COMPUTER ERROR

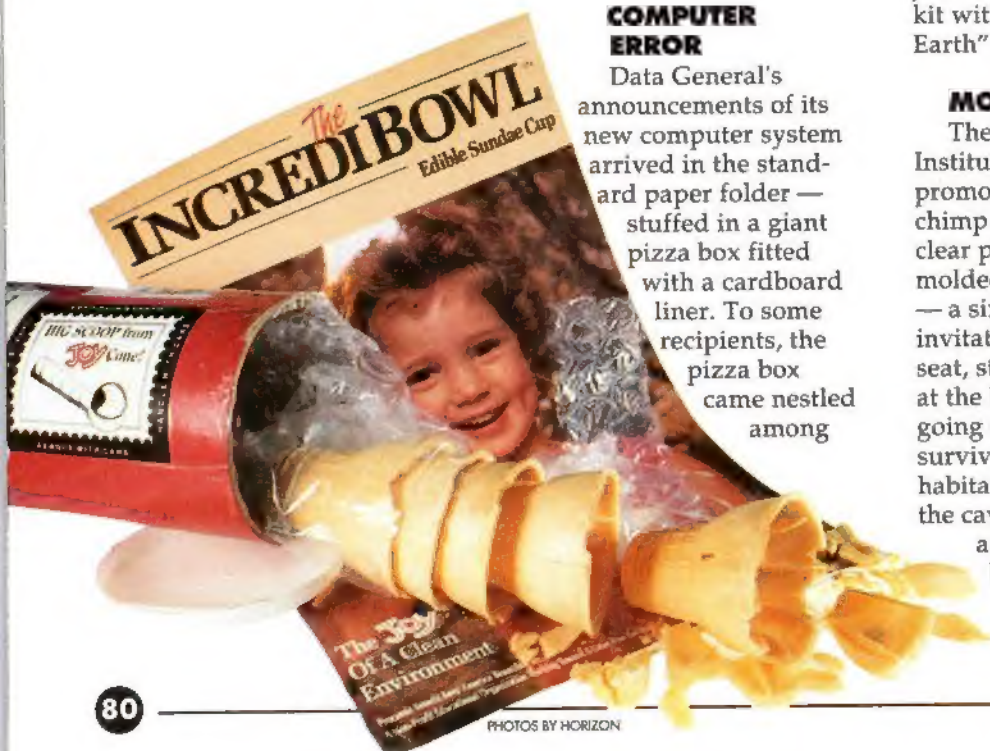
Data General's announcements of its new computer system arrived in the standard paper folder — stuffed in a giant pizza box fitted with a cardboard liner. To some recipients, the pizza box came nestled among



polystyrene peanuts in yet another cardboard box. Because the U.S. Geological Survey is a customer, Data General felt justified to fill a page of the press kit with "Good News For Planet Earth" in two-inch type.

### MONKEY BUSINESS

The Jane Goodall Institute's publicity gimmick promoting a benefit for the chimp researcher is a clear plastic "book," molded to hold a cassette — a six-minute talking invitation. How this \$300-a-seat, star-infested shindig at the Beverly Hilton Hotel is going to help endangered chimps survive poachers and shrinking habitat isn't spelled out. Back to the cave for the bipeds who added a fold-and-tuck "envelope" of bleached white cardboard.







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### HAPPY SHACK

Crammed with cannibalized cars, the Happy Shack seemed to squat on this spit of Brooklyn waterfront. I stumbled across this bizarre scene while looking for views of New York's gleaming, glass and steel skyscrapers.

I used a large format camera and a 25-minute exposure to make this image. When I returned a few nights later, the shack had been bulldozed. Its brick and mortar remains were scattered, adding to the scraps and rubble which edge the East River.

J . B E A L